



Trust Your Supplier

2022

WHITEPAPER

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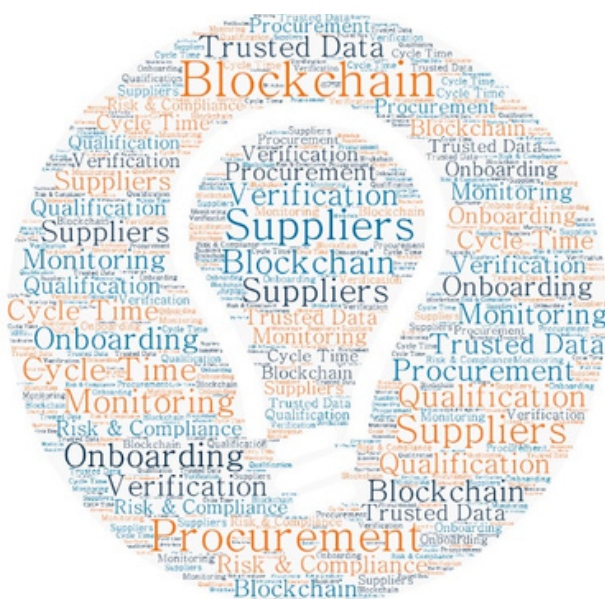
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Abstract

This white paper outlines Chainyard's vision of the future of supply chain management processes, beginning with supplier qualification and onboarding. Reimagining supplier onboarding from the ground up is necessary to leverage critical trends in technology. Key technologies including Blockchain, AI/ML, AR/VR, and IoT will play a significant role in shaping the transformation of supply chains from centrally controlled to decentralized collaborative business networks.

Fundamental to all supply chains is the “supplier”. Globalization requires proper vetting and risk assessment of suppliers across a broad spectrum of subject areas to ensure trust, transparency, and compliance with global regulations. The pandemic has demonstrated that a lack of supplier diversity and reliance on one or two concentrated suppliers can lead to a total supply disruption, higher costs, and process inefficiencies. As part of their material risk and qualification assessments, investors, buyers, and consumers are requiring suppliers to demonstrate ESG (Environmental, Social, and Governance) and sustainability initiatives. Chainyard believes that a blockchain-powered solution such as Trust Your Supplier is foundational to the future of supplier management.

This document describes the design aspects of Trust Your Supplier and how, using the latest technologies, they work together to create a more efficient process to onboard suppliers. The target audience is procurement and technical leaders across industries who are involved with supplier onboarding and risk assessment. The paper goes “wide” versus “deep” into the advantages of adopting a blockchain-driven approach. *Some forward-looking statements and discussions in this document are subject to change based on governance decisions.*



Introduction

Supplier qualification, risk assessment, and onboarding are integral parts of any organization's procurement strategy. Buyer organizations want to build a vendor directory of qualified, preferred suppliers. A typical process involves collecting information and documentation from the vendor, validating, and verifying that information using internal and/or third-party resources, conducting risk assessments, and finally integrating the vendor into the buyer's vendor management system and supply chain. This process is usually owned and executed by a company's **Procurement Organization**. Traditional approaches employ homegrown applications, enterprise resource planning systems (ERPs) such as SAP or Oracle, and specialized applications such as Ariba or Coupa.

But a traditional approach has several weaknesses:



Supplier Discovery & Market Analysis

Finding suitable suppliers is difficult. There is no standard process for discovering potential suppliers and performing analysis on them is challenging. This is due to incomplete information and a lack of available expertise on the buyer's end. Suppliers can waste time repeatedly undergoing the same discovery process with each new buyer, and supplier dissatisfaction and mistrust can be present due to an absence of transparency.



Supplier Information Management & Data Accuracy

There is no real-time or continuous monitoring of supplier information, and multiple hand-offs of that data. Improper data management can result in inaccuracies. Information on an ERP. This can potentially get stale, and if there are multiple instances of the database, out-of-sync.



Single Source for Supplier Risk Management

The supplier risk process is centralized and run by the procuring entity. It is often repeated if the same supplier is to conduct business with multiple procurement departments within a company. Third parties and verifiers are on numerous platforms, leaving companies unable to evaluate supplier risk effectively due to the time it takes to access supplier information through the different platforms. This results in prolonged onboarding times, compounded by the number of manual steps and handoffs and the use of middleware technologies.

To overcome these shortcomings, the industry needs to focus on these key areas:



Standardized & Reliable Data

Standardizing supplier data for use across different buyers, while allowing the supplier to maintain control of its access. It should be considered reliable after validation by third-party verifiers, with buyers having access to trusted real-time information via artificial intelligence and monitoring alerts.



Efficient Onboarding

Reducing or eliminating non-value-added activities and maximizing automation for supplier self-onboarding to save time and money.



Actionable Insights

Augmenting data from external, verifiable sources and decision-supported workflows to create actionable insights.



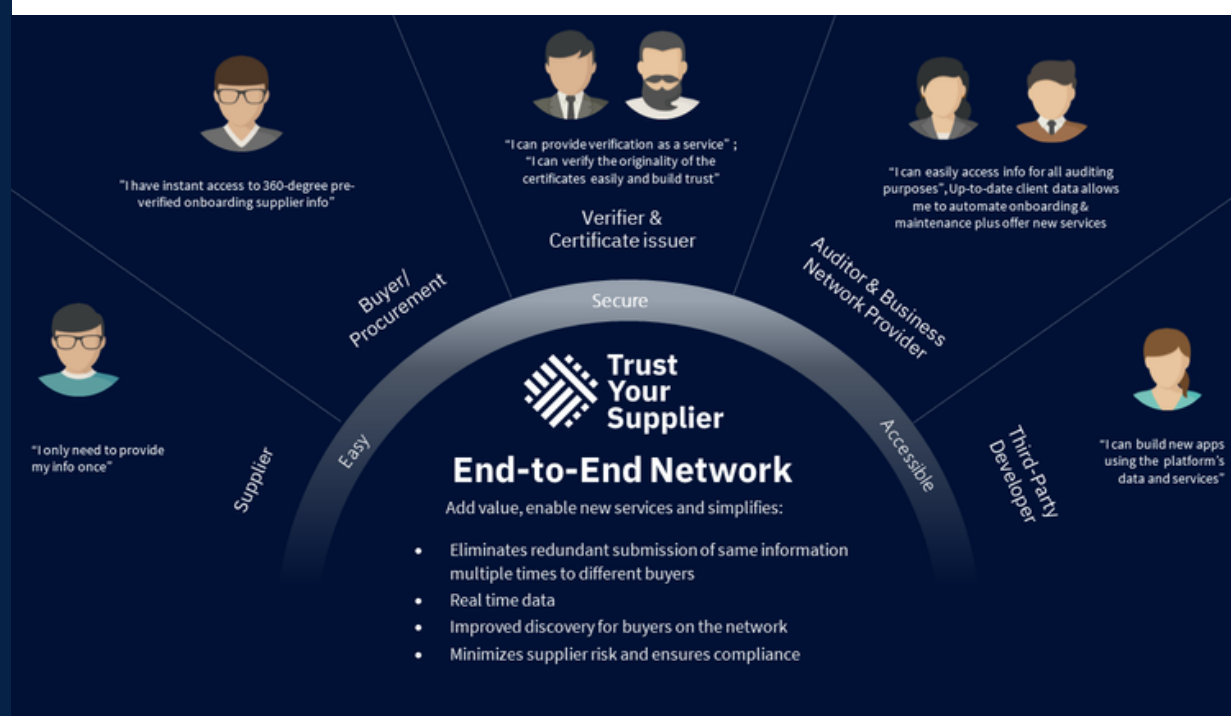
Data Security

Securely storing supplier data within the supplier's control, to share with buyers as needed while following GDPR and other privacy standards. The records of all transactions should be stored within one immutable platform and be accessible at any given point in time with version control, change history, and audit logs.

The Trust Your Supplier (TYS) platform satisfies all these needs. It is an innovative supplier information network, providing organizations with a single point of verifiable truth, transparency, visibility, and risk assessment during supplier onboarding, along with centralized planning and oversight capabilities.

The Trust Your Supplier (TYS) Business Network

The TYS Business Network is a multi-party collaboration between business participants who have common interests and problems. Members of TYS are interested in bringing efficiency into the supplier onboarding process, reducing long-term costs, and responding to changing supply chain events rapidly and smartly.



There are three types of members in the network:

Buyers, who engage with suppliers to procure the components, parts, and services used to manufacture finished products for or provide services to consumers. They manage supply chain risks by assessing suppliers before onboarding them.

Suppliers, who provide the raw materials, parts, and services to buyers.

Third-Party Data Providers, who provide data that evaluates suppliers against various risks, including financial, quality, ESG, manufacturing practices, reliability, and others.

All TYS application users must be registered and enrolled with their organization's Certificate Authority (CA) to receive the necessary cryptographic credentials that are essential to authenticate to the network. The typical TYS supplier onboarding process is simple and decentralized, with data ownership residing with the information provider, who can securely enable access to other network participants.

Competitive Advantage - TYS Over Traditional Models

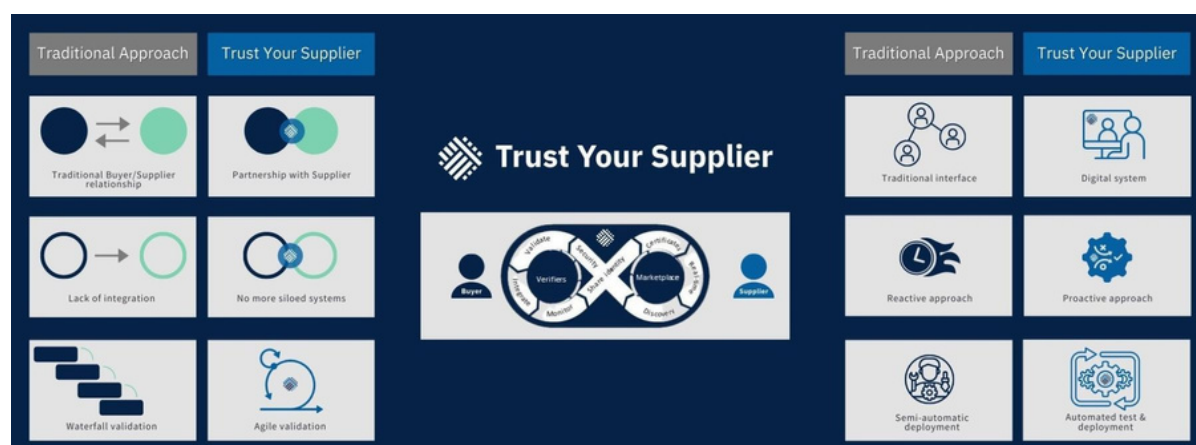
There are several areas in which TYS excels over traditional supplier onboarding processes:

Data Quality: Traditional models have data spread across multiple systems that operate in silos. TYS significantly improves data quality since there is only one instance of the data shared across multiple business entities “at-will”, forcing data owners to ensure point-in-time accuracy of their data.

Common language and vocabulary across the buyer/supplier landscape: Many procurement organizations start the supplier onboarding process when the supplier is awarded a bid, contract, or purchase order. They collect the supplier data onto an Excel-based form and enter it into their ERP. Some buyers then utilize a traditional Source-to-Pay (S2P) solution that allows them to onboard the supplier, but each solution brings its own onboarding questions and lexicon, often tailored to meet the buyer’s needs.

In contrast, TYS uses a single common language and vocabulary across buyers and suppliers, developed through the collective efforts of its members and the Governance Board. They contribute towards standardizing supplier questionnaires that cover a broad set of categories and topics. Internationalization allows the vocabulary to be consistent across language and geographic boundaries, minimizing the difficulties that may be found for buyers when expanding to other markets. This simplifies buyer and supplier communications, eliminating ambiguity and promoting revenue opportunities.

Strong Relationships: TYS provides a collaborative platform with real-time supplier-owned data that is easy to share. This creates a tight partnership between buyer and supplier, along with agile supplier validations



Reduction in onboarding time: TYS improves the efficiency of the supplier qualification process over time by eliminating redundancy, enabling data sharing, and continually reverifying data that has expired or become outdated.

As seen in the adjoining graph, the time taken to onboard a buyer's first supplier is very high. The time steadily decreases for subsequent suppliers, eventually entering a steady state where the onboarding time is minimal. Peaks in the graph indicate where the buyer had additional questions for a supplier, or a change to a supplier's profile data triggered a reverification of that information.

Top & Bottom-Line Impacts: TYS implemented standardization with questionnaires and integrated tools for supplier qualification that has significantly reduced the time from invite to onboard.

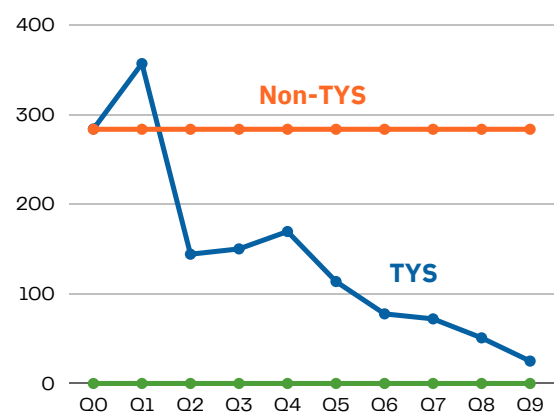
With every subsequent supplier:

- Lower onboarding time due to standardization, automation and self-learning.
- Maturity of the TYS network that allows discovery of trusted suppliers. Hence the time to qualify gradually lowers to a steady state.

Assumptions:

- Clients were previously using a minimally automated supplier onboarding process
- Based on historical data from the TYS application onboarding process with no modifications
- The chart is quarterly averages based on invites and acceptance
- No distinction was made between new or existing supplier

Avg # of Days to Onboard (Y) over time (X)



Period	Days to Onboard	% Reduction
Quarter 0	284	00.00%
Quarter 1	351	-23.56%
Quarter 2	133	53.16%
Quarter 3	133	53.19%
Quarter 4	168	41.07%
Quarter 5	111	41.07%
Quarter 6	77	73.05%
Quarter 7	68	75.93%
Quarter 8	49	82.88%
Quarter 9	28	90.30%

Top line impact: Win/Win

- Buyers & Suppliers generate revenue sooner due to being able to start transacting 90% faster
- Allows buyers to build a dynamic resilient supply chain

Bottom line impact:

90%

REDUCTION OF
SUPPLIER ONBOARDING
CYCLE TIME

The TYS Blockchain

TYS's underlying blockchain framework is the most unique feature that gives it an advantage over traditional supplier onboarding approaches. The technology is based on the proven enterprise-grade Hyperledger Fabric permissioned network, hardened by IBM for deployment on enterprise clouds. It is a core and essential component, powering TYS and producing the following features that allow it to support a trusted supply chain:

Core Attributes

Immutability

- Auditable records of supplier lifecycle events
- Verifiable compliance reporting, notably to support Environmental, Social, and Governance (ESG)

Smart Contracts

- Replace intermediaries, triggering events based on key supplier lifecycle events and attributes
- Maintain transactional integrity

Privacy

- Self-sovereign information management
 - Data is provided and managed by the data owner at will
 - Data is shared by the data owner at will, including when and how much
- Data security and privacy across a multi-enterprise supply chain

Finality

- All blockchain transactions are recorded atomically, leaving minimal scope for latency and tampering

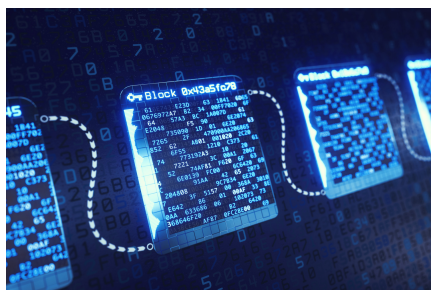
Transparency

- All members have access to the ledger records, but certain details may not be visible due to encryption and lack of permissions

Trust

(in a trustless environment)

- There are multiple copies of the blockchain ledger, distributed among multiple blockchain users. All copies must check to see if each transaction is valid.
 - Trust arises from comparing transactions across these multiple parties in the network, not from trusted relationships or through an intermediary, as in traditional models.
- Intelligent, and digitized.
- Ensures information immediacy (no intermediary) and currency
- Improved data quality and data sharing



Non-Core Attributes



Permissioned

Every member is added by the policies agreed by all the members of the network



Collaborative

Disputes reduced across supply chain participants



Value-Based

Generates overall value for network participants, especially suppliers, buyers, and third-party service providers, with a network effect

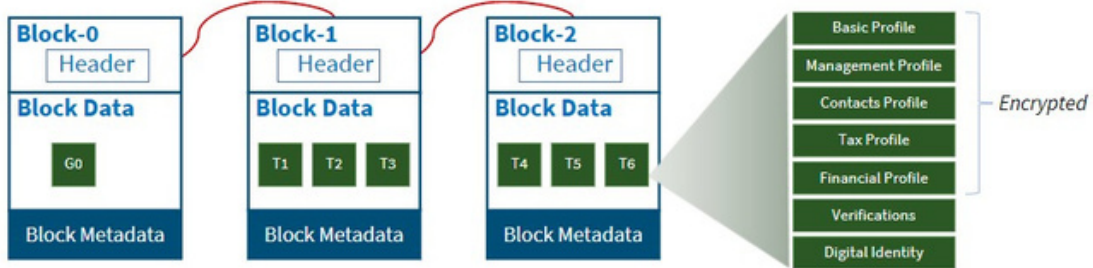
The TYS network is hardened for security and is deployed in a multi-zone, multi-region configuration for high availability and disaster resiliency.

Channels

TYS uses channels, which are private communication pathways that have their own ledger, to scale its business network. Each channel stores a different group of records: • Business entity records • Request responses between TYS and the outside world • Digital identity, badges, and claims

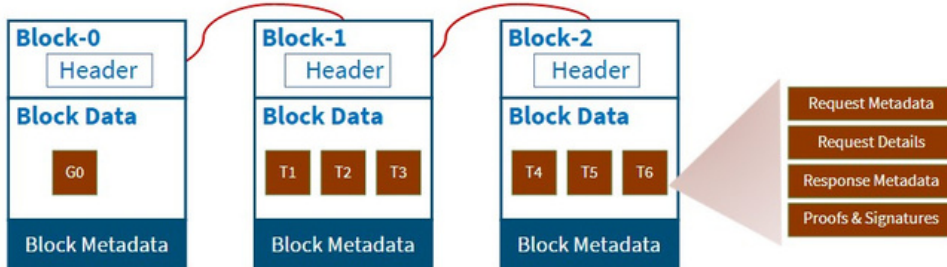
Channel 1: Business Entity Records

Channel 1 maintains business entity records in compliance with GDPR and privacy regulations. The Personally Identifiable Information (PII) is stored off-chain with digital hashes on the chain. The Information provider owns the data on the chain and is selectively shared on an as-needed basis. The owner encrypts and records all data on the ledger except for some basic information that allows others to discover them in the ecosystem.



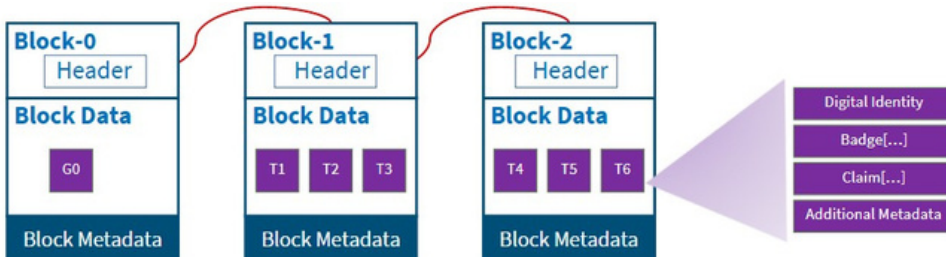
Channel 2: Request Responses between TYS and External Entities

TYS integrates with both external services and enterprise applications. The integration protocol consists of edge services known as “Partner Agents” that communicate with the integration service. Requests and responses must be trusted, so the protocol ensures all necessary checks and balances are in place before any data is recorded in TYS. Communication messages are recorded on the chain, but response data sent by the external entity is not.



Channel 3: Digital Identity

A roadmap feature for a future release, the TYS Business Entity identifier will conform to the DIF standards for “digital identity”. Supplier verifications will be represented as “verifiable claims” which point to actual “facts” stored within TYS or externally within issuing organizations. Verifiable claims may be presented as “badges” that may be presentable to other business entities.



Off-Chain, World States and Ledger

In compliance with privacy regulations, TYS records PII information in an off-chain database instance, with a linked hash on the blockchain. The application can access the off-chain data, the ledger, and the world state through TYS APIs.

Each channel has a **separate ledger** - which means a separate blockchain in which to record information - and separate world states (where the current state/values of the data are stored). Applications and **smart contracts** can communicate between channels so that ledger information can be accessed between them. In future versions of TYS, members may be able to deploy their own chain code extensions on separate channels they own.

Business and Technical Events and Alerts

Information about a supplier is captured via the forms and questionnaires and associated with various data attributes. TYS supports the notion of “smart attributes” whereby business rules, workflows, and validations can be associated with attributes that are of critical importance. TYS will automatically trigger events when these attributes are created or updated by the user.

All information (collection of attributes) about a supplier recorded on the ledger represents the supplier’s “world state”. When a change is made by the supplier to attributes at any point within the life-cycle, the current “world state” is moved to history, and a new “world state” is recorded. All impacted entities are automatically notified of the change in the attribute. If the changes affect a “smart attribute”, events associated with the attribute are automatically triggered. A buyer on TYS can go back in time and get a view of all changes since the supplier’s genesis record was created.

Transaction Model, Integrity & Validation

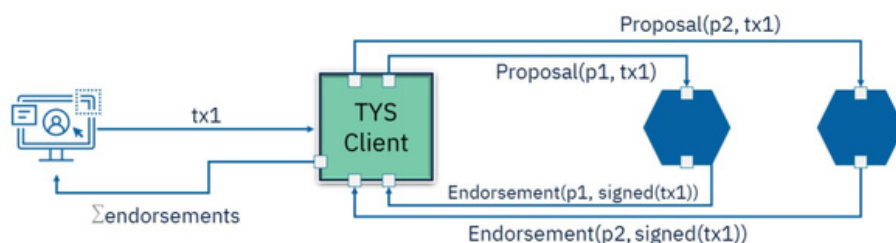
The TYS transaction model is based on Hyperledger Fabric. There are two types of transactions within TYS:

- Those recording a “state change” against a supplier’s key attributes
- Those querying supplier information such as the “current world state” or a transaction history consisting of a series of chronological state changes leading to the state at a particular point-in-time

Every transaction that changes the state of an “asset” on the blockchain follows a two-phased approach:

A **proposal phase** where a user submits a transaction to a set of member peers on TYS for validation and endorsement.

A **commit phase** at the end of the proposal phase, where the user has the option to submit the endorsed transaction for “commit” to the ledger or to simply ignore it. Fabric implements this mechanism to eliminate “non-determinism”.



From a TYS perspective, the proposal phase allows an end-user to validate a transaction. If, between the proposal and commit phases, the user detects changes in other attributes caused by external alerts or notifications, the transaction can be re-submitted for re-endorsement. *In the future, TYS may allow “Trust Anchors” to extend the default endorsement policy with custom validations.*

A user on TYS can submit a transaction to any of the peers on the network, usually the peer belonging to the user’s organization. Users of member organizations who do not operate a peer can submit their transactions to any of the “Trust Anchors”. The TYS client verifies that off-chain data has not been tampered with prior to a state change operation by performing a sanity check against the hash stored on the blockchain.

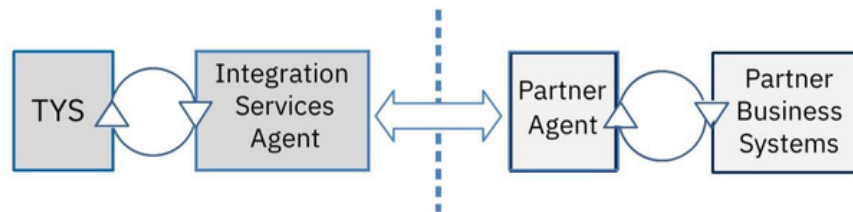
Integration with Enterprise Applications

TYS is just one element of a decentralized supply chain, but it is foundational to all upstream and downstream processes. While many islands of blockchain networks have evolved, our vision within Chainyard and TYS is a world of “integrated”, “interoperable” and “interconnected” networks.



As we wait for this vision to be realized over the coming years, companies must consume TYS data and feed it to their enterprise applications. In addition, they need TYS to notify or alert them when certain business events occur in the lifecycle of the supplier so they can take appropriate actions

To meet this need, TYS provides an integration framework and SDK for TYS and external applications to exchange request-responses via the consumption of APIs. • The TYS platform exchanges messages with buyer enterprise applications, third party service providers, and data verifiers throughout the onboarding process and afterwards • TYS Integration Services is an independent, loosely coupled module that facilitates communication between TYS and those business entities



The “Partner Agent” is a component that can communicate with the TYS Integration Framework (TYS-IF) to receive or send messages. The agent runs within the partner’s boundary and can be executed as-is as a service or customized by the partner to suit its specific requirements. Typical scenarios where the TYS-IF comes into play include:



Supplier Detail View Augmentation

A third-party can augment the current supplier detail view on screen within a subscribed panel in real-time, providing an enriched experience. E.g., Rapid Ratings analysis



One-way Fire-n-Forget Notifications

These notify subscribing partners about supplier-related events occurring on TYS – e.g., notifying Ariba about a newly onboarded supplier



Attribute Value Verifications

TYS makes a request to a partner to validate and verify information provided by a supplier. For example, request the D&B partner agent to verify the D&B number entered by a supplier in a questionnaire



Outbound Request-Response:

TYS makes a request to a third party to provide information about a supplier. For example, pass supplier-related attributes to the GLEIF Partner Agent to obtain business entity hierarchy information



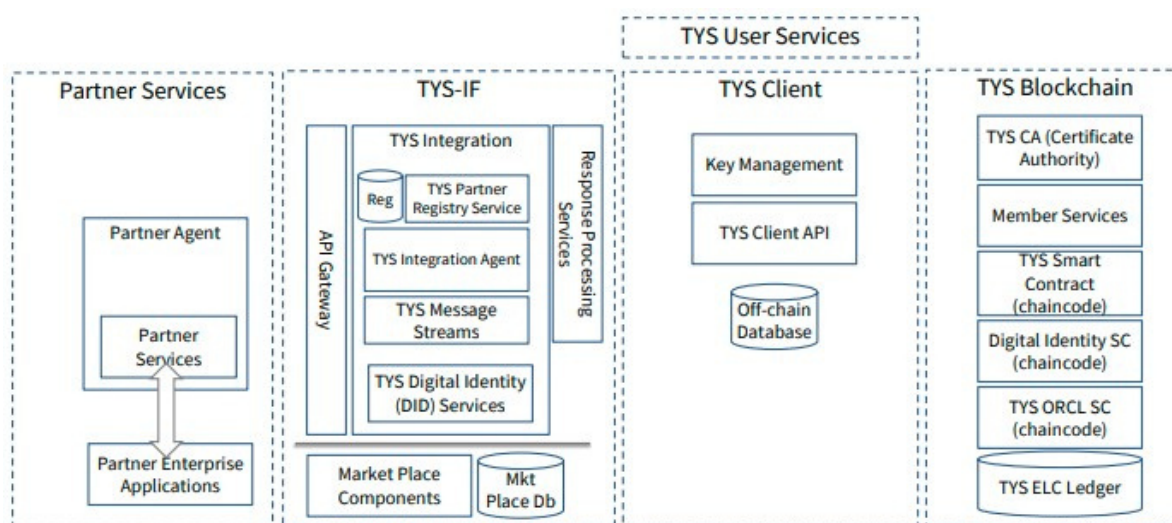
Inbound Request-Response:

A partner makes a request via the partner agent, asking TYS to take some action or respond with some data. For example, a business entity may request TYS to send an invitation to a supplier to join its network by passing over the email contact and other metadata about that supplier

Under the covers, the TYS Integration Framework uses Block Chain Oracles. Every inbound or outbound request-response is recorded on the blockchain to allow for an audit trail, but the actual payload associated with a response is not recorded for ownership reasons.

Response headers capture key elements of the message communication, such as the business entity ID, request type, responding application credentials, and proofs of response. TYS-IF does not monitor or validate the accuracy of the response payload, but it ensures that the requester has adequate evidence and audit trail of the communication to take appropriate action.

The TYS Integration Framework architecture is as below:



(The TYS-IF user guide has additional information on how to configure the partner agents and invoke the REST APIs).

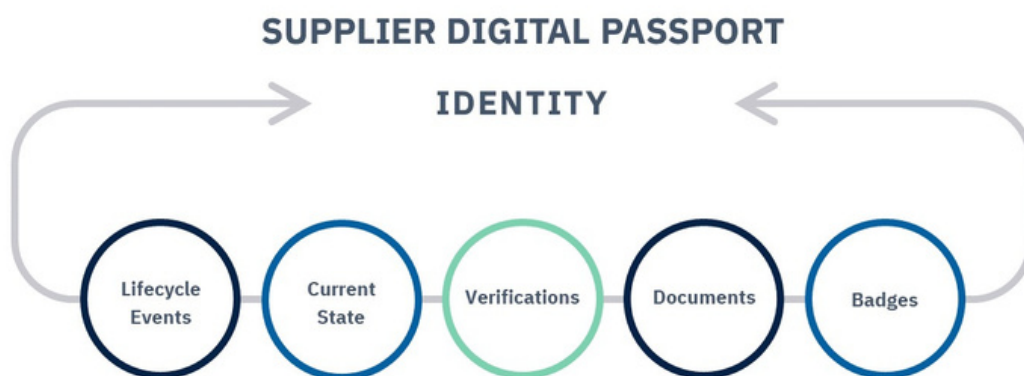
Consensus Mechanism

The TYS transaction model leverages the Hyperledger Fabric RAFT Consensus mechanism, which is a leader-based protocol run by special nodes called “Orderers”. These nodes are responsible for running the RAFT protocol and providing the ordering service. Any organization which runs a “peer” node is also capable of running its own “Orderer” node if wanted. Because Fabric’s design relies on deterministic consensus algorithms, any block validated by the peer is guaranteed to be final and correct. Ledgers cannot fork the way they do in many other distributed and permissionless blockchain networks

RAFT is an efficient consensus algorithm in terms of network bandwidth usage. It takes little time to validate and commit a transaction, allowing for more time to transmit transaction data. The system can therefore have a high throughput, or TPS (“Transactions Per Second”), within the range allowed by the underlying network. **Finality** within TYS is near real-time and dependent on the number of endorsers for a particular transaction and the geographic distribution of “Orderer” and “Peer” nodes

Supplier Digital Identity

Every business entity on TYS receives a unique Identifier. This identifier ties all life-cycle events, documents, and verifications together to offer a unique current and historic perspective of that entity. This ID is different from the cryptographic credentials (the public/private key pair and X.509 certificates) issued by the Certificate Authority.

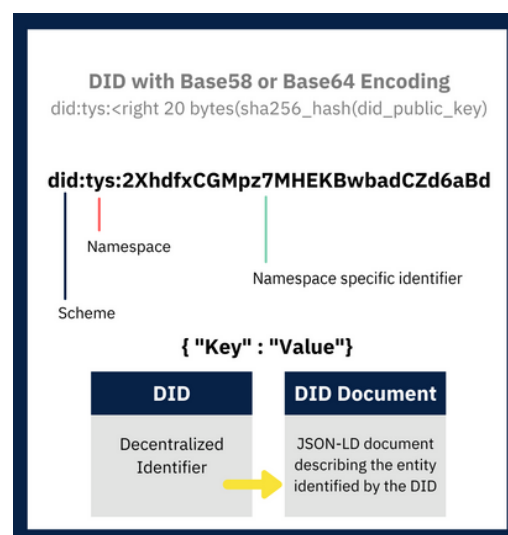


An example of a supplier identifier is –

TYS lets the supplier selectively share some or all their data with other stakeholders upon request. Sharing is enabled by **Digital Keys**, a unique set of paired crypto material that grants the stakeholder access. Digital keys can be turned on or off by the supplier, who retains full control of sharing.

The TYS roadmap includes the migration of supplier IDs to the **Digital Identity** standard being evolved by the [Digital Identity Foundation](#). Using this, the supplier identity will be represented as a text string consisting of three parts:

- The DID URI scheme
- The DID method identifier or namespace
- The identifier of that namespace.



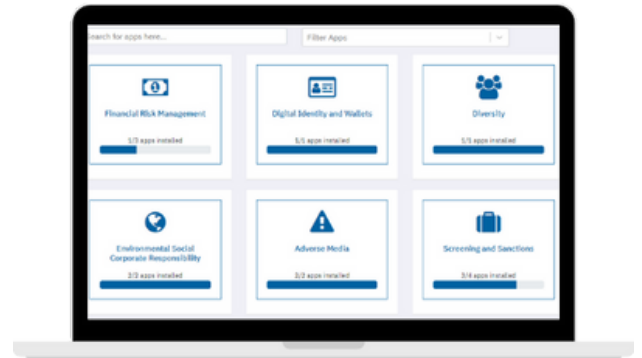
This digital ID will be universally resolvable by any application or browser that supports the protocol. It will be associated with a JSON- formatted document known as the DID document, which can allow access to the elements describing the supplier, as shown in the figure on the right. All verifications associated with the supplier will be handled in a “Verifiable Credentials” format, allowing interoperability between digital identity systems.

TYS’s goal is to allow suppliers to carry their identity as a Digital Passport, easily sharing it with other business entities or regulatory bodies agnostic to TYS.

Supplier Analytics

The TYS business model provides a unique capability for external parties to share analytics application plug-ins in a space called **The Marketplace**. This is enabled through the TYS Integration Framework described in the Integration with Enterprise Applications section.

Third-party service providers provide real-time insights and scores for a supplier, using data collected from various sources. This augments the supplier information views in the application. Certain third parties leverage external news and market analysis and combine that with IBM Watson Analytics to identify changes in supplier profiles.



This automatically triggers full or partial profile re-verifications within TYS, to ensure buyers have the most up-to-date accurate information. A full analytics capability that leverages artificial intelligence and machine learning (AI/ML) is on the TYS roadmap and will provide extra insights to buyers and suppliers. There are a couple of areas under investigation, specifically the application of natural language processing (NLP) to process supplier-provided documents such as financial statements and compliance reports

Procurement Teams Need for Verification



Certified for Business Adoption

Chainyard takes a streamlined and proactive approach to security by including it as a key architectural principle in the TYS design, reducing the time and effort put into security audits.

Chainyard engages third-party experts to conduct penetration tests (PEN tests) multiple times a year to discover any security gaps and data vulnerabilities. All PEN test findings are reported and fixed in order of priority. For the TYS team, data security and privacy are key principles incorporated into the product's architecture and design. The team ensures members' security concerns are addressed across the cloud, the blockchain network, and the application. The commitment to and completion of the SOC audit demonstrates Chainyard's dedication to providing the most secure online proctoring experience for all end users. This is an ongoing effort with annual certifications and process improvements that are responding to everchanging cyber security threats and data privacy regulations.



Decentralized Governance

TYS is operated and managed by the independent business entity Chainyard Supplier Management (CSM), which owns the network and the solution. The governance of the network is implemented as a hybrid on-chain and traditional model.

Governance Board

The Trust Your Supplier Governance Board is comprised of 18 members who are diverse with respect to industry, size, and geographic location, amongst other characteristics, and is intended to represent the views of all members. The purpose of the TYS governance board is to provide guidance for the maturity and growth of the network, and to drive participation through their supplier base. Meetings of the Governance Board are led by a chairman appointed by the company. The Chairman may create one or more committees consisting of one or more members of the Governance Board. Each member of the board is a party to the **Chainyard Supplier Management “Trust Your Supplier” Network Governance Constitution** that formally identifies the board's purpose, outlining how they will govern the network. Governance Board members actively encourage their supply chain and industry partners to adopt the TYS network and increase its reach.



Trust Anchors

Trust Anchors are members of the network who will be collectively responsible for: (i) executing and committing transactions for submission of data to the network; and (ii) serving requests for validation or retrieval of encrypted data held by such members.

Trust Anchors are selected by the Governance Board and are intended to represent a diverse collection of members, who are collectively viewed by other members as trustworthy based upon their position, experience and/or history in their industry.

Trust Anchors guarantee the integrity of data in the network by being responsible for a blockchain peer (i.e., a node) in the network. Each node has independent, encrypted, immutable copies of all data submitted to the network, and is controlled solely by the relevant Trust Anchor. Each Trust Anchor has a responsibility to manage their node.

Trust Anchors do not receive compensation of any kind. Serving as a Trust Anchor does not provide the Trust Anchor with any additional data permissions or visibility; all data handled by a member in its capacity as Trust Anchor is encrypted.

On-Chain Governance

TYS is deployed on Hyperledger Fabric v2.0 and takes advantage of the decentralized governance for smart contracts. Member organizations must come to agreement on the parameters of the chaincode and provide endorsements as per policy before smart contracts can be deployed and activated on the channels.

When YYS upgrades are to be deployed and activated, enough organizations must again approve the upgrade by providing endorsements.

Each anchor tenant is a custodian of a ledger copy. They facilitate transaction endorsements and verification, with the execution and commitment of transactions performed automatically when transaction proposals are addressed to their peer node. Trust Anchors can extend a chaincode for their own use case, such as to perform different validations in the interest of their organization. If the required number of organizations endorse chaincode transactions with matching results, the transaction will be validated and committed to the ledger. This also allows Trust Anchors to individually roll out minor fixes on their own schedules without requiring the entire network to proceed in lockstep.

Conclusion

TYS brings innovative changes to supplier onboarding and risk management, using a variety of new technologies to create a solution that is more effective than those traditionally used by buyers. Unlike traditional approaches that must store data with an intermediary, a blockchain platform allows for a decentralized ledger of transactions along with a world state database, creating an immutable set of data that can be trusted by all participants. The TYS Governance Board complements this well by having members who are buyers using the platform and can give input on how it should function, coming to consensus on improvements and changes.

Other benefits of TYS that are not necessarily available on other platforms include the ability to create different channels and a trusted digital identity for suppliers. APIs allow buyers to directly integrate supplier data in TYS with their enterprise applications. Built-in alerts let buyers know when a supplier's data has changed or gone beyond set parameters so that they can request an overall refresh of the supplier's data.

TYS utilizes other technologies such as smart analytics in the Marketplace. This invaluable resource of third-party apps allows buyers to complete supplier risk assessments without ever leaving the TYS application.

All these characteristics help TYS stand out as an innovative forward-looking solution that strays from typical supplier onboarding approaches, giving companies an alternative way to manage their vendors. The time, money, and number of steps saved with this blockchain-based consolidated approach are likely to be the start of a new generation of products whose level of efficiency is needed in today's supply chain.

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- <https://trustyoursupplier.com/>

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April Harrison, Marketing Director

April serves as the marketing & communications lead for Trust Your Supplier and hosts the Procurement Block podcast. As part of her role, April crafts online, email, video, and application-level communications to promote TYS and to support users.

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