**UN/CEFACT – Blockchain Project – P1049**
UNITED NATIONS
CENTRE FOR TRADE FACILITATION AND ELECTRONIC BUSINESS (UN/CEFACT)
*REGULATORY PROGRAMME DEVELOPMENT AREA (REG-PDA)*
*E-GOVERNMENT DOMAIN (EGOV-D)*

# *Blockchain White Paper*

## *1White Paper on the technical applications of Blockchain to 2 United Nations Centre for Trade Facilitation and 3 Electronic 3Business (UN/CEFACT) deliverables*

**SOURCE:** Blockchain Project Team
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# HOUSE RULES

- Assumed:  attendees have read the documents shared via invite, including the UN/CEFACT Blockchain Whitepaper P1049, the subject of discussion.
- Please state name and organisation, and summarise point form comments are preferred.
- We will go through the sections by number, and will not cover the content of Annex 1 in the discussion.

# Current responses

# 5 I. INTRODUCTION

1 .

The international supply chain can be characterised as a set of three flows - of goods, funds and data. Goods flow from exporter to importer in return for funds that flow in the reverse direction. The flow of goods and funds is supported by a bidirectional flow of data such as invoices, shipping notices, bills of lading, certificates of origin and import/export declarations lodged with regulatory authorities. UN/CEFACT standards have played a fundamentally important role in this flow of data since the 1980s, facilitating trade and driving efficiencies in the supply chain.

2.

These three flows are supplemented by a layer of trust. Trust, or lack of trust, underlies almost every action and data exchange in international trade, including trust in:

- The provenance and authenticity of goods;
- The stated value of goods for the purposes of insurance, duties, and payment; promises to pay;
- The protection of goods during shipping (i.e. integrity of packaging, vehicle and container conditions, etc.);
- The integrity of information that is used by regulatory authorities for the risk assessments which determine inspections and clearances;
- The traders and service providers involved in a trade transaction.

3

This layer of trust has seen relatively little support from technology and is still heavily supported by paper documents, manual signatures, insurance premiums and escrow and other trusted third-party services.

4.

Blockchain, also known as Distributed Ledger Technology (DLT), is a technology that has the potential to deliver significant improvements and automation in this layer of trust.

5.

**As the focal point in the United Nations framework of the Economic and Social Council, UN/CEFACT needs to ask itself how this new technology impacts its work and whether there are any new technical specifications that it should develop in order to maximise this technology's value to UN/CEFACT's constituency. This paper seeks to answer these questions.**

6.

Although this paper is primarily focussed on blockchain, it is important to note that blockchain is not alone in its potential to have a disruptive impact on the supply chain. The rise of e-commerce platforms and cloud-hosted solutions are transforming the way organisations do business. The Internet of Things promises a vastly richer flow of granular data for tracking consignments, containers, through conveyances, ports, and warehouses. And other technologies, such as artificial intelligence and InterPlanetary File System (IPFS) as well as technologies under development such as the semantic web offer powerful new ways to understand and access data. Therefore, this paper will also position blockchain within the broader context of other new technologies that have an enormous potential to improve supply chain efficiency and integrity.

7.

This analysis has resulted in five specific suggestions for UN/CEFACT work to support these new technologies. These suggestions build upon existing high quality work such as the UN/CEFACT Core Component Library (CCL) and process models.

8.

The project team suggests:

- Investigating the development of a reference architecture so that all specifications as well as new technologies can be understood as constituent parts of a consistent whole;

- Reviewing UN/CEFACT process models in order to allow blockchain smart contracts (and other technologies using defined processes) to record key events and resulting changes in the status (state) of an entity such as the approval of an invoice or the release of consignments by a customs authority. This will require process models that are more granular and where the different statuses (states) of key entities are defined. In other words, process models that focus on the state life cycles of key resources in the supply chain such as consignments and containers as well as other key entities such as contracts and payments;

- Performing gap analysis to define what is needed in order to have an inter ledger (i.e. inter-blockchain) interoperability framework for supply chains that establishes cross-ledger trust in the face of the inevitability of a plethora of blockchain solutions;

**8.**

- **Performing gap analysis to define what is needed in order to provide supply chains with a standard way to discover and consume data regardless of which platform hosts information about a resource. It must take into account that cloud-based platforms will be the source of many truths (facts) about supply-chain entities such as parties, consignments and containers; and,**

- **Relying on a semantic framework that releases new value from existing UN/CEFACT work products such as the CCL. With the UN/CEFACT CCL, supply chains will have tools to process the faster and bigger stream of transactions and granular data that are being generated by platforms, IoT and blockchain. The working group further suggests that UN/CEFACT explore the use of ontologies based on the CCL.**

9.

As more platforms produce more data that must be understood by more parties, the value of UN/CEFACT semantics will only increase. There are exciting opportunities offered by blockchain and related technologies and looks forward to participating in work within UN/CEFACT to deliver new technical specifications that will release new value by supporting supply chain interoperability, efficiency and integrity.

# 79 II. PURPOSE AND SCOPE

10

UN/CEFACT standards such as the UN/EDIFACT directories have successfully supported trade facilitation and supply chain automation since the late 1980's. As new technologies, such as XML, emerged in the early 2000's, UN/CEFACT kept pace by releasing new specifications such as the CCL and the Extensible Marked-up Language Naming & Design Rules (XML NDR). However, the last few years have witnessed an unprecedented rate of technological change with the emergence of new technologies such as cloud platforms, the Internet of things, blockchain, advanced cryptography and artificial intelligence.

11.

This poses two questions for UN/CEFACT:

- What opportunities do these technologies present for improving e-business, trade facilitation and the international supply chain?
- What is the impact on existing UN/CEFACT standards and what gaps could be usefully addressed by new UN/CEFACT specifications?

12

These questions are being addressed by UN/CEFACT white papers, each focusing on the impact of one key technology. This paper is focussed on blockchain to create a single architectural vision that positions blockchain within a future environment for supply chain automation that makes the best use of each technology.

13

At its heart, blockchain is a cryptographic protocol that allows separate parties to have shared trust in a transaction because the ledger cannot be easily falsified (i.e. once data is written it cannot be changed). This trustworthiness is created by a combination of factors including the cryptography used in a blockchain, its consensus/validation mechanism and its distributed nature.

**14**

**If you are not familiar with blockchain technology yet, the first two pages of Annex I provide the basis.[1] The terminology used in blockchain (and also in this document) as well as related technologies (such as Internet of Things) are explained there.**

15

Broadly speaking, blockchain technology can be used for four things (explored further in Annex 1), which are:

- A cryptocurrency platform, the best known of which is Bitcoin;
- A smart-contract platform, leveraging its immutable write-once nature;
- An electronic notary guaranteeing the content and, optionally, the time of issuance of electronically recorded data;
- A decentralised process coordinator, leveraging a combination of attributes, including its addressing techniques (public/private key), smart contracts, and 1 immutability.

**16**

**Since the core business of UN/CEFACT is to develop standards to support trade facilitation and supply chain automation, the focus will be on the smart contract, electronic notary and decentralised process coordination features of blockchain rather than cryptocurrencies. Similarly, although blockchain has wide application in sectors such as digital intellectual property rights, digital voting, digital record keeping, and so on, the focus will remain on its use within supply chains.**

17

In this context, there are two types of blockchain implementations (explored further in Annex 1):

- Public blockchain ledgers, such as most cryptocurrency platforms, in which any party can host a complete copy of the ledger and participate in transactions and verifications. The two largest and best known public ledgers are Bitcoin (cryptocurrency) and Ethereum (focussed on smart contracts).
- Private or “permissioned” ledgers, in which a single party or consortium hosts the platform, sets the rules and explicitly grants permissions for other parties to act as nodes and/or perform transactions (performing transactions, which may, depending upon a private ledger’s rules, be open to the public).

18

A useful analogy here is that public ledgers are like the internet while permissioned ledgers are closer to corporate intranets. There are clear value and use cases for each and this paper will discuss both.

19.

**Given the high interest and potential value of blockchain technology, it is not surprising that there are already a large number of projects focussed on (or impacting in some way) the supply chain. These include shipping information platforms run by carriers, container logistics platforms run by port authorities, goods provenance (traceability) platforms, and many others. Most are permissioned ledger implementations. As with any promising new technology that has a rush of commercial implementations, some will fail and there is likely to be a growth phase followed by some consolidation. Nevertheless, technical limitations as well as commercial and political pressures will ensure that there will never be just one blockchain supporting the entire international supply chain. Even a single consignment is likely to touch multiple ledgers during its journey from exporter to importer. Therefore, just as UN/CEFACT has always focused on supporting interoperability between systems, the key technical focus for this paper is on supporting inter-ledger interoperability.**

# III RELATED TECHNOLOGIES

## The Rise of Platforms

20.

A platform-enabled website allows external Application Programming Interface (API) to offer additional functionalities. This means that developers can write applications that run on the platform (located on the cloud), or use services provided from the platform, or both. In pure business terms, a web platform is a business upon which an ecosystem of other businesses can be built. Shared platforms allow for innovation at the platform level, allowing work to be done once while benefiting many. This has allowed business models to emerge that eliminate intermediaries (create disintermediation) and create new efficiencies, disrupting the markets for intermediary services and lowering costs. A classic example of this disintermediation is the market for travel agency services.

21.

However, at least as important, is the trend of established businesses such as carriers and couriers to provide APIs that allow their services to be seamlessly plugged into the systems of other businesses. The transition from desktop business applications such as small business accounting packages to cloud hosted platforms is also a notable trend.

22.

The rise of e-commerce platforms has some profound impacts on electronic data interchange. Among these impacts are the following:

- The integration paradigm, instead of trying to exchange business-to-business messages between millions of individual businesses, integration is achieved simply by using APIs to connect together a few platform applications.
- Aggregation paradigm, the natural aggregator of businesses is shifting from centralized Electronic Data Interface (EDI) hubs that connect different parties, often on a semi-monopoly basis (because buyers dictate which hub must be used), to platforms where the sellers and buyers use their own platforms and then the platforms exchange data between one another. This means that sellers no longer have to deal with connecting to multiple hubs and it also allows them to take advantage of services on their platform that can analyze/use the data being exchanged.
- Discoverable data, platform APIs offer real time access to the resources (e.g. invoices, consignments, containers, etc.) that they host via simple web Uniform Resource Locators (URLs, i.e. web location). They can also emit events when a resource changes state (e.g. a container becomes “sealed” or “delivered” or an invoice becomes “paid”). What this means is that rather than exchanging large complex data structures as EDI messages, platforms can publish links to their resources and individuals can subscribe for the state changes which they find of interest.

23.

There are some business risks with platforms:

- Platform operators may incorporate selected functionalities or services (provided by themselves) into the platform itself which prevents others from innovating in those areas on that platform and creates an incentive to drive innovations off-platform. This is less of an issue with platforms that are decentralized, or are operated in an open way by regulators rather than commercial interests.
- As platform adoption approaches market saturation (meaning most of the market uses the platform), the dysfunctions associated with monopolies (or, when there are just a few firms, oligopolies) come into play with fewer incentives to innovate, improve services and lower costs. In addition, network effects (the value provided to the community of additional users) diminish and zero-sum games become the main economic drivers. This situation naturally drives platforms to exploit asymmetric information advantages (such as surveillance-based business models) and replace their emphasis on innovation and collaboration with an emphasis on cost reduction, even at the expense of customers (a lack of credible alternatives for customers meaning that the platform has less need to be concerned with their satisfaction).

24.

In general, the consequence of these kinds of behaviour are new spin-off platforms that attract customers away from more established platforms. To prevent this, platforms sometimes implement lock-in strategies that increase the cost and difficulty of transferring to alternate platforms.

## B. The Internet of Things

25.

The Internet of Things (IoT) describes a network of sensors or smart devices that are connected to the Internet and generate a stream of data. Many blockchain trade applications use data generated from the IoT for processing by smart contracts. For example, sensors in containers and in ships, ports and railway infrastructure might be used to track container movements and then this information could trigger actions based on previously agreed smart contracts.

26.

IoT data feeds are generally owned by infrastructure operators, value-added service providers, or specific platforms, and their availability is already being used as a source of differentiation and competitive advantage between platforms. This data is often made available through platform APIs or using message-based approaches. The impact on international trade and blockchain applications will be a significant increase in the volume and timeliness of supply chain data.

# IV RISKS AND OPPORTUNITIES

## A Plethora of Ledgers

27.

An increasing number of individual corporations, government agencies, and industry consortia are recognizing the value of blockchain technology (beyond cryptocurrencies) and are building platforms that intersect in some way with the international supply chain. Some are focussed on transport logistics, others on trade financing, others on goods provenance (traceability). Some are international and some are local or regional. As with any new technology there is likely to be a surge of initiatives followed by some market consolidation. Nevertheless, the eventual landscape will be characterised by a plethora of different ledgers, with different characteristics including trust. Furthermore, data about a single consignment is likely to be provided to or obtained from several different blockchain ledgers.

28.

Possible examples of related data being recorded on different blockchain ledgers include:

- The commercial invoice may be recorded on financial industry ledgers focussed on trade financing and insurance;
- Consignment and shipping data may be recorded on ledgers run by freight forwarders and couriers;
- Container logistics information and bills of lading may be recorded on a ledger run by carriers and/or port authorities;
- Permits and declarations may be recorded on ledgers run by national regulators.

29.

Blockchain technology does not solve the interoperability problem that UN/CEFACT standards have always supported. Also, different blockchains are far from equal in terms of the level of trust that participants should place in them. A permissioned ledger run by a single corporate entity with very or relatively few nodes will have much less resistance against hacker attacks than a public ledger such as Bitcoin, a permissioned ledger with thousands of nodes, or a large multi-party permissioned inter-ledger operated by multiple entities.

30.

At the same time, the implementation of blockchains, together with other technologies such as the IoT and cloud platforms, is creating more and more electronic data that needs to be shared across supply-chain participants.

31.

The opportunities for UN/CEFACT are:

1) To ensure that its semantic and business process modelling standards are fit for purpose in blockchain environments, and
2) To identify what needs to be done in order to ensure the most efficient and effective use of blockchain technology by supply chains and all their participants, including government authorities.

## B. A Profusion of Platforms

32.

There is likely to be some overlap between the scope of a platform and the scope of a blockchain ledger. In some cases there could be a 1:1 relationship where a given platform is also the host of a single permissioned ledger. Some platforms won't use blockchain at all, others will interact with multiple blockchain ledgers and still others may share a blockchain ledger. A potential use case could be a national platform hosting approved certificates of origin and participates in a multi-country blockchain ledger created through multilateral arrangements and in which multiple national platforms handling certificates of origin each host a node.

33.

**In any case, while blockchain ledgers are intended to provide a certain level of trust, platforms support the flow of data. As discussed in the previous section on the rise of platforms, they can provide data, which in some cases is authoritative, about a resource such as a consignment or a container. In a few rare cases, a single platform might hold all the authoritative data about a single consignment and its related data (commercial and logistical). In that case, the problem of discovering all related information about a consignment would be simply a case of querying the single platform. However, this is most likely to be the exception rather than the rule. Therefore, the interoperability challenge includes a discovery problem - given an identifier of an entity (e.g. a container or consignment number), how to locate the detailed information about it?**

**34.**

**There is an opportunity for UN/CEFACT to identify what needs to be done in order to ensure that all supply-chain participants can locate the data that they need (and that they are entitled to access) about a given transaction, even if the data is scattered across different platforms and blockchains. Such a resource discovery protocol, allowing supply chain participants to discover the detailed data about a resource given its identifier, would allow a profusion of platforms to work like a virtual single global platform.**

**C. A Torrent of Data**

**35.**

**While traditional structured document exchanges (of invoices, bills of lading, declarations, etc.) will remain a critical part of the data landscape, the rise of platforms and IoT will bring an additional stream of more granular data such as the events in the lifecycle of a consignment or container or conveyance. This granular data might be discovered by following a link in a blockchain, or by following the identifier of a resource in a document. Whatever the discovery mechanism, there remains a challenge to actually making sense of the transaction or data stream if different platforms, different blockchain networks and different IoT applications present the same information (semantic concept) differently.**

**36.**

**There is an opportunity for UN/CEFACT to leverage its existing semantic standards such as the CCL.**

# 290 V. PUTTING IT ALL IN CONTEXT

37.

Technologies such as blockchain, IoT and platforms can each, independently, contribute to increased supply chain efficiency. At the same time, when working together within a standards-based framework, the sum can be much greater than the parts. In this context, it could be very useful to develop a conceptual model of the international supply chain that shows the role of each technology within the broader map of stakeholders, services, and standards. Such a model would work equally well for the domestic supply chain, which is just a simpler subset of the international supply chain.

## A. A Context Model For Trade Technologies

38.

The diagram in Figure 1 shows a draft conceptual model of the international supply chain with relevant technologies. Importers and exporters often facilitate the flow of goods, funds and data, as well as the relevant trust by using a variety of service providers and third parties. Overlaying blockchain and other emerging technologies on the model can show the relationship with the new UN/CEFACT specifications suggested later in this paper. Some other observations related to this diagram are:

- All parties in this example use one or more platforms to conduct their business. This may be a single organisation-level internal platform, e.g. a corporate Enterprise Resource Planning (ERP) system, but increasingly will be cloud-hosted web platforms for most participants.
- Platforms may use IoT data sources and APIs to improve the information flow.
- Platforms may use private blockchain ledgers to improve trust by recording immutable and auditable transactions.
- An inter-ledger framework, eventually prepared by UN/CEFACT, could provide trust between platforms.
- A resource discovery framework, eventually prepared by UN/CEFACT, could provide a means to locate the authoritative data source for a resource based on its identifier.
- UN/CEFACT trade data work such as the CCL provides semantic anchors to facilitate data exchange.

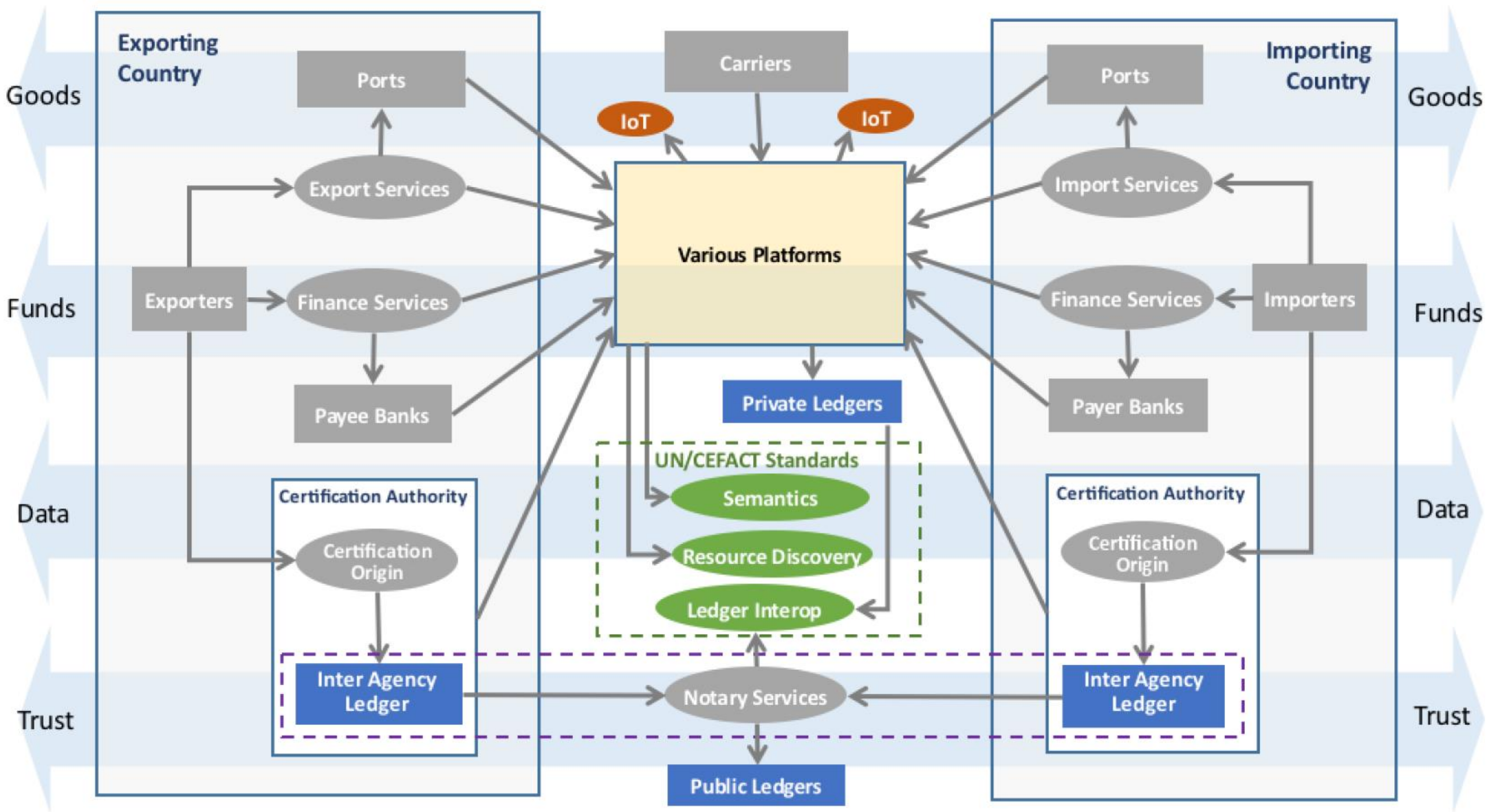


*Figure 1 - Draft Context Model for ICT Trade Technologies*

39.

Arrows between boxes/ovals in the diagram represent dependency relationships so should be read as “uses” or “depends on”. They do not represent flows of information which are between various platforms and ledgers.

40.

Multiple platforms exist to address different needs in the trade and transport sectors, and will continue to evolve through innovation in IoT, AI and other emerging technologies.

41.

National regulators play a special role in the network as they provide a unique point of convergence for data in each jurisdiction.

- Data is often being integrated data from multiple sources ranging from traditional document-based data sources to more detailed digital data entries and can come in higher volumes and can be delivered in real-time. The same can be true for key transport hubs such as sea, air and dry ports.
- Authorities are unlikely to surrender control of their information and processes by conducting regulatory business on a shared platform outside their jurisdiction. They will, undoubtedly, maintain independent systems, but find new ways to verify and appropriately share data with other countries.

**42.**

**All of the above underlines the growing complexity and multiplication of systems and data that traders and authorities will need to deal with in the near and long-term future.**

**43.**

**Standards-based semantic models could facilitate this widening network of data exchange around trade transactions and support traders as they look for flexible integration across a diversity of platforms (including diverse blockchain-based applications).**

**44.**

**A complete example of a possible blockchain trade scenario is presented in Annex 2.**

# 345VI. SUGGESTED WAY FORWARD FOR UN/CEFACT

45

Based on the opportunities identified and positioned above, there are some clear gaps that UN/CEFACT is uniquely positioned to fill. The project team suggests that UN/CEFACT work with national delegations and its experts to establish working groups to progress the following new technical specifications.

## A. A UN/CEFACT Architecture Reference Model

46.

Just as UN/CEFACT semantics standards are mapped to UN/EDIFACT and XML through technical specifications like the XML NDR, so it must be shown how UN/CEFACT's semantics can be mapped to newer technologies such as blockchain, big data, and web platform APIs. Also, as data flows become more granular, it will be increasingly important to model the detailed semantics of processes as well as data.

47.

All of these drivers will lead to a number of new technical specifications and related semantic work. In order to have these specifications understood as parts of a consistent bigger picture, it is suggested that a reference architecture specification be developed that shows how all technical specifications work together. This work could use the context model presented in this document as a starting point.

## B. Process Modelling In Support Of Smart Contracts

48.

Significant economic commitments between agents may be associated with specific events in the lifecycle of a resource. Possible examples include:

- An invoice transition from “received” to “approved” may trigger the release of low cost trade financing for small suppliers.
- A consignment transition from “landed” to “cleared” represents the release of goods by a regulatory authority.
- A shipment resource that transitions from being in the possession of agent X to agent Y when containers are sealed and loaded under a bill of lading.

49.

If these events can be notarized as smart contracts in a trusted blockchain ledger, then there is a unique opportunity to improve and automate this trust in the supply chain. But only if there is a clear shared understanding of the meaning of each state transition (including the triggering conditions).

50.

Therefore, a review is suggested of the existing UN/CEFACT Modelling Methodologies and standards (Business Requirement Specifications and Requirement Specification Mappings) to identify what modifications would be needed to support blockchain and smart-contract based applications.

**378C. Inter-Ledger interoperability framework**

51.

As more and more applications anchor their transactions into various private and public blockchain ledgers, there will be an increasing need for a means to discover and integrate transactions across blockchains.

52.

As discussed earlier, each transaction on the chain contains only the hash of the actual data and a minimal amount of metadata about the document or transition state. With clear semantics in the metadata, parties can discover data of interest in other ledgers by observing linked-data anchors and traversing them to obtain appropriate access.

**53.**

**Also, as discussed earlier, each node on a blockchain has a complete copy of the ledger. Specific ledgers (and the nodes that verify transactions) will typically exist for a specific geographic or industry segment. But if a specific international consignment touches a dozen different ledgers, it is impractical for a party that wishes to verify the transactions to host a dozen different nodes. A common inter-ledger notary protocol would allow authorized parties to verify transactions irrespective of which ledger they are created on.**

**54.**

**Therefore, the project team suggests the establishment of a technical working group to review existing work by standards organizations in order to identify if there is a need to collaborate with them on a possible framework for inter ledger interoperability specifications that would define:**

- **Standards for on-chain metadata;**
- **Standards for inter-ledger notarization.**

**55.**

**This specification will most likely build upon (and not duplicate) existing specifications such as Hyperledger chain code, Ethereum solidity code, and multi-hash.**

**D. Resource discovery framework**

**56.** Resources, such as invoices, consignments, certificates of origin, containers, etc., will be increasingly hosted on web platforms. This means that the source of truth about supply chain entities will be online and discoverable, vastly increasing supply chain transparency. At the same time, even for a single international consignment, these truths (information resources) will exist on many different platforms. It is impractical to expect every authorized party to be a registered member or customer of every platform that holds some relevant data. However, it could be possible, given the identifier of a resource, to develop a consistent means to discover where it is hosted and be granted access to appropriate data. If this were done, then the disparate web of platforms could work as one.

**57.** As a result, it is suggested that UN/CEFACT develop a specification that bridges independent platforms to discover resource data independent of where it is stored. Basic requirements for the specification would include the ability to:

- Resolve the identity of parties, platforms and other agents participating in trade-related activities, using identity providers from all jurisdictions and sectors.
- Access current and authoritative information about the public keys of participants, to enable secure direct interaction and communications.
- Support a diversity of entity types (e.g. businesses, jurisdictions, platforms, containers) including high volume entity types (e.g. consignments).

**58.** This specification should build upon (and not duplicate) existing, relevant technical elements from existing specifications.

## E. Trade data semantics framework

59.

After all the technological wizardry, organizations in the supply chain still must be able to make sense of the data that is discovered / exchanged by various platforms, ledgers, or even network connected sensors. However, as described in the chapter on the rise of platforms, the landscape is changing from EDI hub-centric models to peer-to-peer exchange where platforms are the natural aggregators. The traditional document centric transaction is complemented / enriched by a fast moving stream of events about all the resources in the supply chain.

60.

In this context, there is an opportunity to increase the value of UN/CEFACT semantic standards through a technology where:

- UN/CEFACT explores the use of ontologies based on the CCL and if this approach may be better adapted to the use of blockchain technologies.
- Communities of interest (e.g. fast moving consumer goods in a country) can overlay the core UN/CEFACT semantics with an industry / geography specific framework that effectively says “this is how we use the UN/CEFACT standards in our context”.
- Platform operators can release semantic frameworks that map their interfaces to UN/CEFACT standards.

61.

As a result of the above, runtime tools (called inferencing technology) for a particular business in an industry sector that uses a specific platform could overlay all three semantic frameworks to consistently use and create UN/CEFACT standard data from any platform that meets their industry / geography specific needs.

## F. Blockchain application data needs

62.

There is an immediate need to work with blockchain application developers to identify data that requires definition and is not covered by current UN/CEFACT standards (specifically, the CCL) and to develop related Business Requirement Specifications and core components in order to cover that gap. In particular, there is a requirement, from within a business document or transaction, to reference data (one or many) located in a particular blockchain (out of many).

63.

This review should also look at any new needs created by off the chain data used in blockchain applications. Most data will not be kept on a blockchain, rather it will be referenced (pointed to) together with a hash for data verification and perhaps a time stamp. There may also be a requirement to describe various cryptographic primitives for the purpose of referencing them from business documents. For example, hashing algorithms, key distribution, cryptographic signatures and encryption schemes.

**64.**

**At the same time, this blockchain capacity will result in an exponential growth in systems that reference data which has been generated by diverse sources - resulting in either high costs for harmonization or high error rates as data is used that is based on different definitions. In conclusion, there is an urgent need to look at not just blockchain data but, perhaps even more importantly, the data used by blockchain-based applications especially in areas like trade that are horizontal and use data from almost all sectors of economic activity. As a result, it is suggested that UN/CEFACT consult and engage with technical standard bodies and review existing technical standards to see what might be relevant for developing trade facilitation applications using blockchain.**