WORLD CUSTOMS ORGANIZATION
ORGANISATION MONDIALE DES DOUANES
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Brussels, 12 March 2024.

Digital Customs

Concept paper on the use of blockchain by Customs

(Item X.b on the Agenda)

SUMMARY

Purpose of document

The purpose of this document is to invite the Permanent Technical Committee (PTC) to discuss, and potentially endorse a draft concept paper on the use of blockchain by Customs. The paper has been further developed based on an outline presented to the PTC at its Meeting in October 2023. During the meeting, the PTC provided input and guidance on the outline. .

Action required of the Permanent Technical Committee

The Permanent Technical Committee is invited to discuss, provide input and potentially endorse the draft concept paper on the use of blockchain by Customs.

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I. Background

1. At its Meeting in October 2023, the PTC was presented with an outline of a concept paper on the use of blockchain by Customs. The concept note was proposed considering the Study Report on Disruptive Technologies lists blockchain technology as one of the technologies studied and indicates a certain level of interest by Customs administrations in adopting the technology. Some 35% of 110 respondents reported different statuses of blockchain implementation (i.e. proof of concept, pilot and full deployment). The Study Report also describes some obstacles in adopting blockchain, including lack of expertise (demonstrating that blockchain is considered a complex technology) and costs (indicating that blockchain-based solutions are more expensive than conventional digitalization solutions).

2. Considering the potential benefits of blockchain features for cross-border trade and digitalization of procedures, as well as the obstacles in adopting the technology, a concept paper on blockchain was proposed to help untangle and simplify blockchain's complexity and justify the cost of blockchain implementation in view of the identified benefits. The concept paper will serve as a reference guide for Customs administrations when considering adoption of this technology.

3. At its Meeting in October 2023, several PTC delegates emphasized the importance of addressing data protection and the right to privacy. The Zero Knowledge protocol, a method of verifying a statement without revealing any information other than the fact that the specific statement is true, could be used with blockchain stating that this could solve many problems with the actual access to data. In addition, it was suggested to address two additional matters i.e. how to deal with data protection and the fact that blockchain is immutable and secondly how to deal with Customs operations which are by nature mutable taking into account that blockchain is immutable. A delegate noted the three elementary ecosystems listed in the outline and suggested bringing different blockchain ecosystems together to allow a seamless flow of information across the supply chain.

4. In addition, an observer highlighted the purpose of blockchain technology to enable Customs to obtain data from the sources rather than rely on the intermediaries, and emphasized the importance of interoperability and data standardization, either at the technology level or at the data level, where the WCO Data Model would play a crucial role. The observer noted the WCO's cooperation with the International Chamber of Commerce to accelerate supply chain digitalization and data standardization as an effort to ensure end-to-end interoperability. Another observer suggested a balanced approach so as not to oversimplify cross-border trade processes and acknowledge the complexity of supply chain data flows where processes were nonlinear.

5. The outline was further developed into a draft paper by taking into account the input, comments and guidance provided by the PTC. The draft paper is attached as the Annex to this document.

II. Action required of the PTC

6. The Permanent Technical Committee is invited to discuss, provide input and potentially endorse the draft concept paper on the use of blockchain by Customs.

Concept Paper on the use of Blockchain by Customs

I. Introduction

1. The WCO Strategic Plan[1] 2022-2025 includes Technology and Innovation as one of its focus areas (FA1) acknowledging that the importance of technology is undeniable in today's world and could be further explored by the WCO at many levels to move towards SMART (Secure, Measurable, Automated, Risk Management-based, and Technology-driven) borders to create a sound ecosystem based on adequate interconnectivity between actors in international supply chains, supported by technological applications and innovative solutions. This focus area aims to reduce the digital gap between Members and initiate concrete steps towards the full digitalization of procedures, data analytics and the exchange of information in a dematerialized way. FA1 highlights the need for harmonized and comprehensive approaches, preventing the proliferation of activities developed in isolation and responding to the needs of Customs, other agencies and the entire supply chain.

2. Digitalization of Customs procedures is a key component of border modernization as it enhances cross-border trade efficiency and ensures effective Customs control. Digitalization enables Customs to use electronic information and utilize automated clearance, risk management and targeting processes. In particular, Customs risk management capabilities allow Customs to determine their level of intervention based on a shipment's risk profile.

3. Digitalization is a journey of continuous improvements. Digitalization improvements may include increasing data quality, simplifying processes, improving interoperability between relevant parties and systems, reducing and eliminating manual processes, bridging digital gaps, addressing fraud, increasing cybersecurity, and complying with legal requirements such as data protection and privacy policies.

4. New technological developments often contribute to improving the digitalization of Customs procedures. In particular, it has been claimed that blockchain can revolutionize cross-border trade processes and regulatory procedures. Some of the key blockchain features and their benefits for cross-border trade processes and regulatory procedures are described in the table below.

Features	Benefits
Transparency	level playing field; increased integrity.
Distributed network architecture	connecting different supply chain stakeholders; eliminating redundant intermediaries; removing the risk of a single point of failure; removing the need for a centralized platform/hub.
Immutability	ensuring the authenticity of trade data/documents; providing a single version of truth; increasing trust in using electronic information; improving data quality; preventing fraud (e.g. data tampering); enabling an audit trail.

5. Taking into account the potential benefits of blockchain functionalities for cross-border trade and the digitalization of procedures as well as the barriers to the adoption of the technology, a concept paper on blockchain is proposed to help unravel and simplify the complexity of blockchain and to justify the costs of blockchain implementation in the light of the identified benefits. The concept paper will, among other things, serve as a reference for Customs administrations when considering the adoption of this technology. It will help to identify the use case for blockchain adoption, the added value of blockchain for the selected use case and whether the implementation costs can be justified, other stakeholders potentially involved in blockchain and their roles, the governance model (including data governance), processes and services implemented on top of the blockchain solution, data clusters and the most appropriate blockchain technology.

6. The WCO Study Report on Disruptive Technologies lists blockchain technology as one of the technologies studied and indicates a certain interest of Customs administrations in adopting the technology. About 35% of the 110 respondents reported different stages of blockchain implementation (i.e. proof of concept, pilot and full deployment). The study report also describes some barriers to blockchain adoption, including lack of expertise (demonstrating that blockchain is considered a complex technology) and cost (indicating that blockchain-based solutions are more expensive than traditional digitisation solutions). However, blockchain-based supply chain initiatives have also shown that there are benefits that can be realized for supply chains if these challenges are overcome.

7. In line with the principles of the WCO Strategic Plan that each initiative should be implemented in harmony with other and previous initiatives, the concept note will examine how blockchain is relevant to existing WCO instruments and tools, such as the Single Window Compendium, Globally Networked Customs (GNC), Coordinated Border Management (CBM), the WCO Data Model and the E-Commerce Framework of Standards.

II. The use of blockchain for Customs purposes

II.A. Understanding blockchain

8. In their simplest form, blockchains are the digital equivalent of ancient stone ledgers. They are storage devices - a kind of database - for recording and verifying transactions and terms of engagement. Just like their ancient counterparts, they can record information about any number of things: who owns a particular asset, who bought a particular product from whom, or who has the right to make a particular kind of decision. The blockchain's list of records grows continuously as new transactions take place and are added to the records.

9. In addition to its function as a storage device, the blockchain is also a network of computer nodes linking different parties, where all parties have full copies of the records. When a new record is added to the blockchain, the changes are replicated and distributed to all nodes in the network. The blockchain network allows information to flow within the network and has the ability to securely move any type of data between participants in the network on a peer-to-peer basis, while making the record instantly available.

10. Unlike traditional digital ledgers, which are vulnerable to unauthorized changes, the blockchain is tamper-proof. Transactions or blocks added to the ledger are linked together in chronological order, digitally signed using a specific cryptographic algorithm (hashed) and time-stamped, making the technology inherently resistant to data alteration. Data recorded on a blockchain cannot be changed retroactively without changing all the subsequential records.

11. Blockchain uses a consensus algorithm to ensure immutability. The consensus algorithm is a set of rules or protocols that allow nodes in a blockchain network to agree on a shared state of the network. They are used to ensure that all networks agree on the validity of transactions and the order in which they are added to the blockchain. However, a blockchain network should ideally consist of two or more nodes owned by different parties, creating an environment where no single entity has full control of the networks. In the absence of multiple nodes, the consensus algorithm may be compromised, leaving the blockchain network vulnerable. Blockchain's resilience to data tampering makes it known as a trust engine.

12. Blockchain's immutability, distributed network architecture and provenance are key pillars that potentially take cross-border digitalization to the next level. Blockchain's immutability guarantees the level of security of electronic information, especially against the risk of data tampering. It brings more confidence in the complete transformation of paper-based processes to digital ones, as it can mimic the characteristics of stamped paper that represent the authenticity and validity of the information in the document.

13. Blockchain's distributed network architecture connects different parties involved in complex supply chain processes and brings them together, enabling smooth flow of information that is otherwise fragmented and disconnected. Blockchain networks operate based on peer-to-peer connectivity, without the need or dependence on a centralized hub or data storage. A centralized hub often acts as a 'single point of failure', a critical weakness in the resilience of the network. Peer-to-peer connectivity reduces the role of intermediaries in the supply chain and enables data to be accessed directly from the source of the truth, when and where it was generated in a particular transaction.

14. In addition, the chronological order of blockchain records enables supply chain traceability, providing information on the provenance, audit trail and full history of goods movements, making the supply chain more predictable.

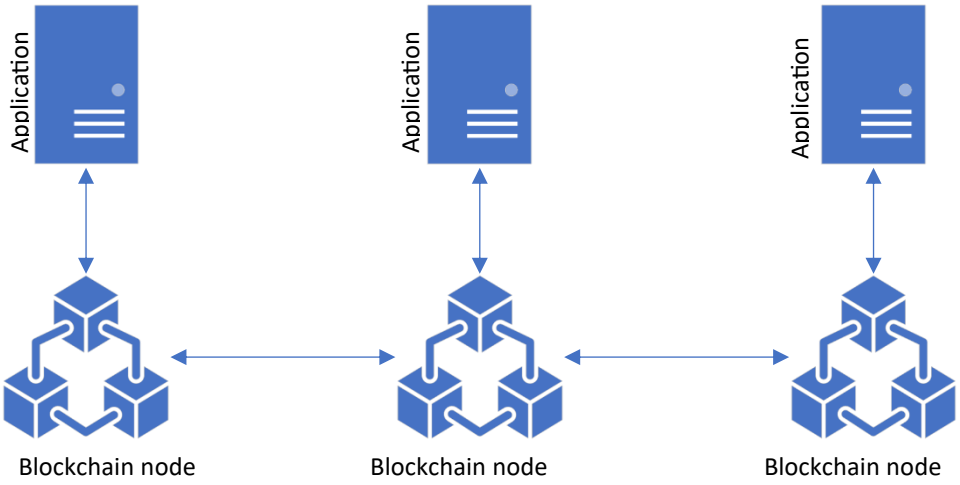
15. For simplicity, this document uses the term blockchain to refer to the broader Distributed Ledger Technology (DLT) or other similar technologies that offer characteristics that blockchain has (e.g. immutability and distributed architecture). DLT has emerged as an umbrella term for technologies that store, distribute or exchange value between entities/users/peers, publicly or privately, based on shared transaction ledgers.

16. Blockchain is a specific type of DLT with a very specific technology underpinning - a type in which transactions are grouped into blocks, validated and added to the transaction chain by consensus. It enables businesses to interact more efficiently and securely across a wide range of business applications. Blockchain has the potential to support the trade facilitation agenda by providing confidence in the provenance of raw materials and goods, transparent production processes and supply chains, and their compliance with national and international standards and regulations. It can also support effective risk management and controls where needed, for example to strengthen supply chain security and safety (including product safety), to curb illicit trade and drug trafficking, to ensure compliance with import/export regulations and to enforce intellectual property rights. Blockchain could contribute to the sustainability of economic operators and promote responsible business conduct and due diligence.

17. This document is not intended to prescribe or advocate any particular technology. WCO Members should determine the solution that best meets their specific needs, while respecting the need for interoperability.

II.B. Roles of Customs in a blockchain network

18. Blockchain is typically implemented by operating a node of a blockchain network and operating a software application that accesses the node. By operating a node of a blockchain network, a blockchain participant gains access to the records stored in or linked to the blockchain to which it is authorized and uses them for further digital processing by the software application. To operate a blockchain node, participants must invest in a computer system capable of performing resource-intensive cryptographic operations that contribute to the blockchain's consensus mechanism.

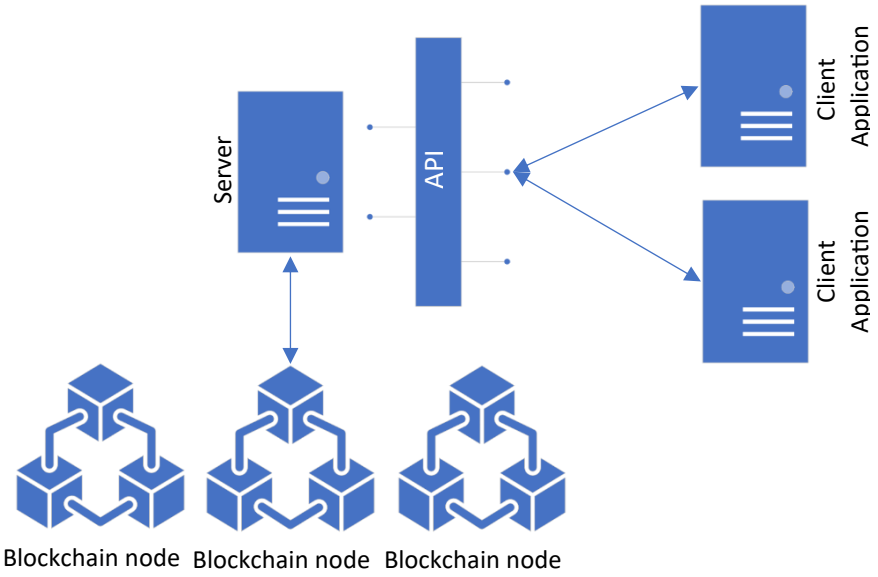


19. bConnect[1], a blockchain implementation for the exchange of records of Authorized Economic Operators, is an example of a native blockchain peer-to-peer architecture, meaning that there is no central node or other hierarchy. The network has five members, namely Argentina, Brazil, Bolivia, Paraguay and Uruguay, and six transaction validators.

20. Some blockchain-based digital solutions separate the blockchain validation mechanism from data access, where data access is provided through a software application (such as a web or mobile application) or an application programming interface (API), and the blockchain network is only used as a truth engine. This implementation model mimics the Software as a Service (SaaS) cloud delivery model, where the user acts as a service consumer who is only interested in accessing data stored in the blockchain via the API, without necessarily participating in the network as a node and contributing to the consensus mechanism and helping to increase the blockchain's resilience. Unlike the native blockchain-based distributed network architecture, the blockchain-based SaaS is based on a centralised architecture.

21. Usyncro[2] is a blockchain-based digital solution that implements the SaaS model. It provides a collaborative, open and secure platform for a global, interoperable and independent environment that includes all actors in the supply chain. It provides security through the use of a unique code generated by blockchain technology and synchronisation across the supply chain. The platform provides instant access to file information from anywhere with just an internet connection, even from mobile devices and smartphones. Usyncro also provides connectivity through API to its business partners' systems.

[1] Study Report on the Disruptive Technology, p112
[2] Study Report on the Disruptive Technology, p189



22. Customs can participate in a blockchain-based digital solution as a blockchain node, a system consumer, or both. Customs' participation in a blockchain network as a node helps to increase the resilience of the blockchain network and reduce blockchain vulnerabilities due to attackers gaining majority access, which can lead to the compromise of a blockchain network. The contribution of blockchain verification is particularly necessary in permissioned blockchain environments, where the number of participating nodes is limited.

III. Blockchain Ecosystem

23. The blockchain network can be implemented in different domains, with each domain of implementation consisting of nodes representing blockchain participants with different roles in the processes enabled by the blockchain network, creating a unique ecosystem.

24. As a network and data store, blockchain operates at the 'transport layer' of an application stack, where it could be implemented in a relatively similar way regardless of the ecosystem. The main challenges in implementing blockchain are in establishing the ecosystem, which includes bringing together different stakeholders and defining processes, data requirements, governance mechanisms, and legal and institutional frameworks. Therefore, defining the ecosystem and its components could help accelerate the implementation of blockchain.

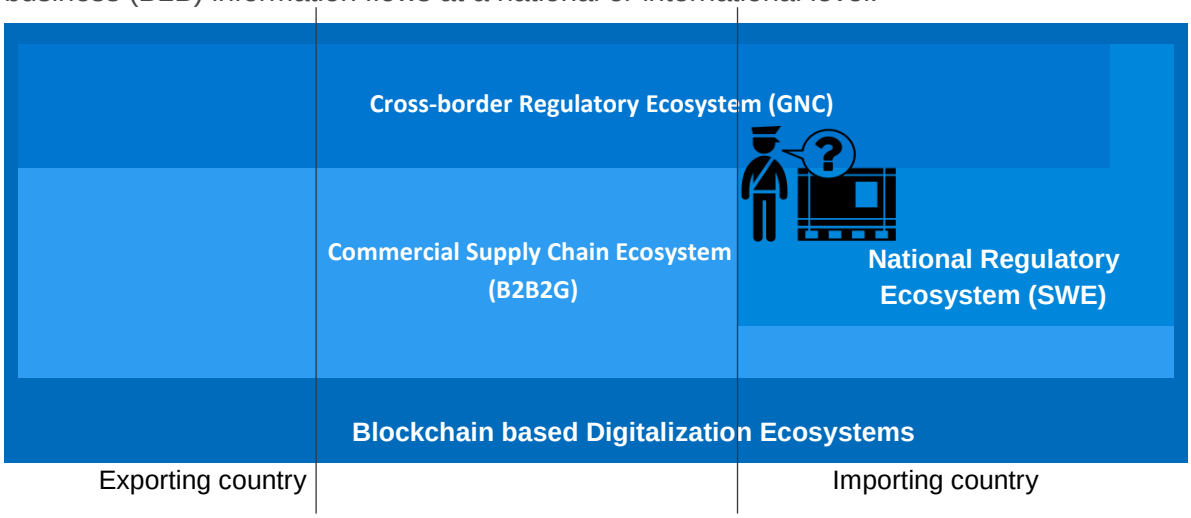
25. In recent years, there have been new developments and pilot implementations of blockchain in different areas. For example, the WCO report on disruptive technologies outlined thirteen blockchain use cases in a variety of areas, such as Authorized Economic Operator master data exchange, government-to-government tax information exchange, temporary admission process, port community systems, trade document verification system, maritime logistics data integration, cross-border e-commerce platform, automated Customs clearance systems, and digitalization of logistics track and trace.

26. The variety of use cases shared by WCO Members and other stakeholders provided rich insight into how a Customs administration can implement blockchain. From a supply chain information flow perspective, the many use cases for blockchain implementation could be organized into different ecosystems, as follows:

- National regulatory ecosystem (Single Window Environment): Single Window is a digital collaboration ecosystem between and among cross-border regulatory agencies, including Customs, at the national level. The objective of the Single

Window is to enable a single submission of data to meet all import, export and transit related regulatory requirements. The ecosystem primarily consists of government-to-government (G2G) information flows at the national level.

- Cross-border regulatory ecosystem (Globally Networked Customs (GNC): GNC is an ecosystem for the global interconnection of Customs administrations in order to promote cooperation between governments in Customs matters and to deliver significant benefits to all stakeholders. The ecosystem consists primarily of G2G information flows at the international (bilateral or plurilateral) level.
- Commercial supply chain ecosystem: The Commercial Supply Chain Ecosystem consists of economic operators such as sellers, financial institutions, buyers, logistics providers, transporters and marketplaces that undertake different supply chain processes such as sales, trade finance and logistics to move goods across borders. The ecosystem primarily consists of business-to-business (B2B) information flows at a national or international level.



27. Blockchain ecosystems were not introduced to limit the scope of blockchain implementation, but to help organize the many different areas where blockchain could be implemented, and to simplify and understand how blockchain could be implemented in the ecosystem. In practice, there may be an overlap or combination of two or all three ecosystems. For example, once a blockchain ecosystem is established for the commercial supply chain, Customs and partner government agencies could consider connecting the single window systems to the blockchain network, allowing all relevant government agencies to access commercial data.

28. The WCO has developed several instruments and tools that could contribute to the establishment of national (SW) and cross-border regulatory ecosystems. To this end, this document briefly outlines the two ecosystems, focusing on the relevance of blockchain technology to both ecosystems. In contrast, the commercial supply chain ecosystems will be discussed in more detail, as there is more scope for developing instruments and tools in this area.

III.A. National Regulatory Ecosystem (Single Window Environment)

29. A Single Window, as defined in the UN/CEFACT Recommendation 33[3], is a facility that allows parties involved in trade and transport to submit standardized information and documents to a single entry point to fulfil all import, export and transit related legal requirements. Where information is submitted electronically, individual data elements should be submitted only once. Article 10.4 of the World Trade

[3] https://unece.org/trade/publications/recommendation-no33-recommendation-and-guidelines-establishing-single-window

Organization (WTO) Trade Facilitation Agreement (TFA)[4] provides an international instrument for the implementation of a Single Window, stating that Members shall endeavour to establish or maintain a Single Window.

30. To support capacity building efforts, the WCO has developed a Compendium on "Building a Single Window Environment". The WCO Single Window Compendium was updated in 2017. In the new Compendium, which still consists of two volumes, the chapters have been renamed as Parts (Part I, Part II, etc.). Each Part focuses on a specific area of the SW environment and provides comprehensive guidance on the building blocks of Single Window implementation, including its processes or services, data requirements, governance mechanisms, and legal and institutional framework.

31. The Single Window Compendium does not explicitly provide guidance on how blockchain could be implemented in a Single Window environment. However, it does identify key areas where blockchain technology could provide support. For example, Volume 1 Part VII on addressing legal issues and Part VIII on ensuring quality, security and privacy indicate the requirements for non-repudiation and data integrity in the SW environment to ensure the observability and auditability of actions by individuals.

32. None of the case studies presented in the disruptive technology study report link the implementation of blockchain to Single Window. However, Guatemala has adapted its port community systems with blockchain technology. In addition, the government of Egypt, which has made Advance Cargo Information (ACI) declarations[5] mandatory for all cargo entering Egypt from 1 July 2021, which will be managed through a blockchain-powered National Single Window for Foreign Trade (NAFEZA) platform. The ACI declaration system will use the CargoX platform for Blockchain Document Transfer (BDT).

III.B. Cross-border Regulatory Ecosystem (Globally Networked Customs (GNC))

33. GNC is the information exchange between Customs administrations. It promotes cooperation between governments in Customs matters and provides the basis for Customs and border agencies to extract value and efficiency from their existing processes through enhanced information sharing. It enhances trade facilitation by synthesizing existing commercial, regulatory and transport information available to different supply chain stakeholders and can be a key enabler for smoother trade flows, improved risk management and intelligence, and regional integration initiatives. GNC can also play a key role in the dematerialization of supporting documents.

34. The GNC includes Utility Block (UB) concepts that break down the Customs business into discrete but related components. The UB makes the GNC simple (deal with one thing at a time), manageable (do it in a way that is standardized and repeatable), evolutionary (do what is happening now but improve it) and low cost (use what is already there and done). The UB includes comprehensive frameworks needed to build cross-border regulatory blockchain ecosystems based on key harmonized/standardized components: 1. Institutional and legal framework (name of the UB, purpose, benefits and legal basis and compliance), 2. Process alignment (business rules, triggers, entities and data clusters), and 3. Technical interoperability (service interface, communication and integration).

[4] https://www.wcoomd.org/en/topics/wco-implementing-the-wto-atf/atf/formalities-connected-with-importation-and-exportation-and-transit.aspx
[5] https://smartmaritimenetwork.com/2021/04/21/egypt-deploys-blockchain-based-single-window-for-cargo-documents/

35. The current version of the GNC Handbook does not include guidance on the use of blockchain for Customs to Customs interconnectivity. However, some Members shared their practices on the use of blockchain in cross-border data exchange, including the CADENA project, a blockchain-based solution implemented by Peru, Costa Rica and Mexico to address the challenge of exchanging data on AEO companies and their certificate status in real time under the MRAs. In addition, Singapore and Australia completed a blockchain pilot to prove that trade documents can be issued and verified digitally between two independent systems, reducing cross-border transaction costs. The pilot successfully tested the interoperability of two digital verification systems - Australia's Intergovernmental Ledger (IGL) and Singapore's TradeTrust Reference Implementation - using the Certificate of Origin (CO) as an initial test case.

III.C. Commercial Supply Chain Ecosystem

36. International trade moves goods across borders and is an ecosystem with many moving parts. It involves many different parties, including manufacturers/producers, sellers, buyers, logistics providers, transporters, exporters and importers. It involves complex processes of manufacturing, distribution, trade finance and logistics. These supply chain processes use, process or generate a variety of documents/data such as sales contracts, commercial invoices, packing lists, proofs of payment and bills of lading. From a Customs perspective, most, if not all, of the information required by Customs at the border comes from data generated from commercial activities.

III.C.1. Customs Access to Commercial Supply Chain Data

37. The blockchain ecosystem of the commercial supply chain enables Customs to access data required for border clearance directly from the source, beyond the traditional primary data provider, namely the declarant, thereby improving efficiency and data quality.

38. The WCO Integrated Supply Chain Management Guidelines highlight how the increasing use of Information and Communication Technologies (ICT) in the international supply chain and the growing digitalization of business processes is leading to greater availability of information, including commercial data, in a standardized electronic format for use by Customs and other relevant government agencies. This provides opportunities for Customs administrations to access the necessary information, potentially from the primary source, to improve their risk management.

39. A number of approaches have been identified to enable Customs to access commercial supply chain data, including:

III.C.1.a. Supporting Documents

40. Standard 3.8 of the General Annex (GA) to the Revised Kyoto Convention (RKC) outlines that a declarant is responsible in lodging and ensuring the accuracy ofa Goods declaration.

Standard 3.8 of the GA to the RKC

The declarant shall be held responsible to the Customs for the accuracy of the particulars given in the Goods declaration and the payment of the duties and taxes.

41. In addition, Standard 3.16 of the GA to the RKC outlines the requirement for documents in support of the Goods declaration when necessary.

Standard 3.16 of the GA to the RKC

In support of the Goods declaration the Customs shall require only those documents necessary to permit control of the operation and to ensure that all requirements relating to the application of Customs law have been complied with

42. The Guidelines for the GA of the RKC provide examples of supporting documents which include a commercial invoice, import or export license, certificate of origin, preferential tariff arrangement document, health or phytosanitary certificate or transport documents. In addition, Volume 2, Part VI of the Single Window Compendium on Dematerialization and Paperless Processing divides supporting documents into two categories, namely key business documents and regulatory documents. Examples of key business documents include invoices, packing lists, purchase orders, delivery notes, bills of lading and consignment notes.

43. Traditionally, supporting documents are attached to the Goods declaration. Some countries allow supporting documents to be submitted to Customs at a later stage, or do not require them to be submitted at all, provided they are held by the declarant. Customs may also require that these documents be kept at their disposal for a specified period of time. For the application of security measures in general and for risk management policy in particular, Customs may also require the provision of information prior to the arrival of the goods. Standard 3.25 of the GA of the RKC allows for the lodging of the Goods declaration and supporting documents prior to the arrival of the goods.

44. With blockchain technology, where all parties in the supply chain are connected to the blockchain ecosystem, they are technically supposed to provide Customs with economic data generated from supply chain activities. However, given that some of the economic operators (such as sellers, financial institutions, logistics and transport operators) operate in the exporting country, they can't be required to provide the supply chain commercial data to Customs in the importing country, as they are outside the jurisdiction of the importing Customs. Therefore, the provision of the data to Customs has to follow the traditional approach, i.e. by the declarant. The blockchain network helps to simplify the provision of the information by the declarant, as the information is already available.

III.C.1.b. Authorized Supply Chain

45. The SAFE Framework of Standards (FoS) introduced the Authorized Supply Chain (ASC), a concept whereby all participants in an international trade transaction are recognized by Customs as complying with certain standards for the secure handling of goods and relevant information. Consignments moving entirely within such a chain from origin to destination would benefit from an integrated cross-border simplified procedure, with only one simplified declaration containing a minimum of information required for both export and import purposes.

46. The SAFE FoS outlined the requirements for advance electronic information in time for a proper risk assessment to take place.

SAFE FoS Standard 6 – Advance Electronic Information

The Customs administration should require advance electronic information in time for adequate risk assessment to take place.

47. The SAFE FoS outlined the use of Authorised Economic Operators' systems where, in the context of the Authorised Supply Chain, the possibility for Customs to have on-line access to the commercial systems of the parties involved, once any confidentiality or legal issues have been resolved, would provide improved access to authentic information and the possibility for far-reaching simplified procedures. Given that confidentiality and legal issues have been highlighted, they will need to be addressed in a Mutual Recognition Agreement/Arrangement between partner countries.

III.C.2. Nonlinear supply chain.

48. The availability of supply chain information in an electronic format enables Customs to perform automated data processing, such as data matching, cross-checking, risk management and targeting, thereby reducing the need for manual intervention by Customs officers.

49. However, due to the non-linear nature of supply chain processes, the Goods declaration may not always have a one-to-one relationship with the supply chain information, preventing automated reconciliation between different sources of information. Some examples of discrepancies between trade data and the Customs declaration may include

- Different level of detail of commodity information in transport documents and Goods Declaration
- Different commodity grouping due to multiple products in the sales or payment documents having the same tariff classification that should be presented as one item in the Goods declaration, and vice versa.

50. The use of identifiers at different levels of the supply chain data could help to resolve such discrepancies by establishing links between different commercial documents and the Goods declaration.

51. One of the identifiers established by the WCO is the Unique Consignment Reference (UCR). Like an electronic staple designed for e-commerce, a UCR ties together information - all the data about a trade transaction, from the initial order and shipment of goods by a supplier, through the movement of those goods and their arrival at the border, to their final delivery to the importer.

52. The main objective of the UCR is to define a generic mechanism that is sufficiently flexible to deal with the most common scenarios that occur in international trade. The basis of the UCR is to maximize the use of existing supplier, customer and transport references. It is also a reference number, primarily for Customs use, and may in the future be required to be reported to Customs at any point during a Customs procedure. The UCR should be:

- applied to all international movements of goods for which Customs control is required;
- be used only as an access key for audit, tracking and tracing, information and reconciliation purposes;
- be unique at both national and international levels;
- applied at the consignment level; and
- issued as early as possible in the international transaction.

53. Another identifier to be considered would be the one at product level to help reconcile the product lines on the commercial documents, such as the invoice, with the commodity lines in the Goods declaration.

IV. Legal Framework and Compliance

54. Blockchain-based digitalization needs to be supported by a sound legal framework and comply with a number of legal requirements. In the context of a national regulatory blockchain ecosystem, Volume 2 - Chapter VII of the Single Window Compendium provides comprehensive guidance on how to address legal issues related to the implementation of a SW environment. In this chapter, the Compendium outlines that for a SW to function properly, there should be a sound definition of the legal authority to perform certain services. As the SW operates in a

digital environment, there should be enabling national legislation to allow trade-related and regulatory documents to be electronic. In addition, Chapter VIII provides guidance on ensuring quality, security and privacy, requiring the SW to comply with national laws on data protection and commercial confidentiality.

55. In the context of the cross-border regulatory blockchain environment, the GNC Handbook includes a "Legal Toolbox". The GNC Legal Toolbox describes the various provisions to be considered by parties to a GNC exchange agreement when dealing with the new concepts of mutual administrative assistance that GNC implies. In parallel with the approach taken in the overall development of the GNC, the toolbox is a practical set of legal protocols, standards and guidelines that provide flexibility and ease of use. Some of the key areas addressed by the Legal Toolbox include: (1) the automatic nature of GNC information exchange; (2) the establishment of the function of GNC data exchange is defined in the Utility Block; (3) the use of information; and, (4) confidentiality and protection of information.

56. Blockchain technology contains features that inherently pose legal challenges in terms of data protection, including the right to be forgotten, data alteration and privacy preservation. In terms of privacy preservation, given that blockchain records are replicated across the blockchain network, every node in the network effectively has access to the records. A number of approaches to address blockchain privacy include:

- Implementing access control and multiple cryptographic protocols to hide blockchain information from anyone not authorized to access the data.
- Use of Zero Knowledge Protocol, a method of verifying a statement without revealing any information other than the fact that the specific statement is true. For example, Zero Knowledge Protocol could be implemented to verify the validity of an AEO status without revealing the details of the AEO. While Zero Knowledge Protocol is effective for simple true/false verification, it may not be applicable where there is a need for extensive use of Customs data processing, such as for risk profiling or targeting.

57. Some legal frameworks outline data retention requirements related to the right to be forgotten, which requires personal data to be deleted after a certain period of time. The immutability of blockchain prevents the deletion of records stored in the blockchain. Some of the approaches to address blockchain data retention and the right to be forgotten include:

- Using an off-chain method, where the blockchain records only store the signature (i.e., hash) and reference to the actual data stored elsewhere. In order to comply with data retention and the right to be forgotten, the deletion could be performed on the actual data, thereby invalidating the data signature stored in the blockchain record.
- Deletion of the cryptographic secret key used to decrypt the data. In the absence of the cryptographic secret key, the data stored in the blockchain is unreadable, which has the same status as being deleted.

58. Standard 3.27 of the GA of the RKC outlines that Customs shall allow the declarant to amend the goods declaration.

Standard 3.27 of the GA to the RKC

The Customs shall permit the declarant to amend the Goods declaration that has already been lodged, provided that when the request is received they have not begun to check the Goods declaration or to examine the goods.

59. Some of the approaches to meeting data change requirements may include:

- Record versioning: Create a new version of the record that includes the necessary changes and invalidates the previous record.
- Deleting the previous blockchain record using the 'pseudo deletion' method, as described in addressing data retention issues, and creating a new record that includes the necessary modifications.

V. Interoperability

60. In many cases, new technological developments offer new opportunities to improve efficiency and increase competitiveness. In some cases, new technologies also offer options that are better suited to current needs and operating environments. However, and particularly in supply chain ecosystems, the diverse choice of digital technologies needs to take into account the need for interoperability with other and existing technologies, considering that, in the bigger picture, the efficiency of the supply chain process is determined by the smooth flow of information from one system to another.

61. Blockchain, as a network and storage, operates at the infrastructure level of the digitalization technology stack. It is crucial to ensure interoperability between one blockchain ecosystem and another. Otherwise, a phenomenon of blockchain islands may emerge, which, instead of promoting blockchain interoperability, may increase supply chain fragmentation.

62. There are at least two levels of interoperability of blockchain-based interconnectivity. (a) Interoperability at the blockchain level, i.e. ensuring that the immutability of the record is maintained when the record leaves/transfers/replicates to another blockchain platform. (b) Interoperability at the data/message level, ensuring consistency in data structure/format that allows different platforms to process the information without data translation.

63. A number of initiatives have been launched to address the requirements for interoperability at the blockchain level. The global approach discussed in the WTO paper "Can blockchain revolutionize international trade" would be to create an inter-ledger notarization system that would allow authorized parties to verify transactions regardless of the ledger on which they are created. Notarization could be performed by a single entity or by multiple entities, but at the cost of reintroducing some degree of centralization.

64. Interoperability at the message level is more feasible. The WCO has developed the WCO Data Model (WCO DM), which is defined as a compilation of clearly structured, harmonized, standardized and reusable sets of data definitions and electronic messages designed to meet the operational and legal requirements of Customs and other Cross-Border Regulatory Authorities (CBRAs) responsible for border management. With a focus on the regulatory space, the WCO DM could facilitate interoperability in the regulatory blockchain environment.

65. In order to ensure the smooth flow of information throughout the supply chain, the WCO cooperates with and supports the International Chamber of Commerce (ICC) in its Digital Standards Initiative (DSI). The initiative aims to address the unintended consequence of fragmentation of the market and platforms used by different industries in the international supply chain and public authorities. DSI aims to promote policy coherence and to harmonize digital trade standards for the benefit of businesses, governments and people around the world.

66. The WCO has supported DSI by joining its Governance Board as an observer, taking into account the fact that the initiative is in line with the WCO's objectives in the area of supply chain interoperability and that it could help the WCO to reach out to supply chain parties to promote and accelerate the implementation of

international standards, including the WCO DM. The strategic objective of this collaboration is to enable the seamless reuse of key trade documents, such as invoices, packing lists and bills of lading, for regulatory purposes.

67. The mapping of key trade documents to the WCO DM enables Customs administrations to extract information from these documents that is relevant for Customs purposes.

68. The WCO also participates as a member of the DSI Technical Working Group on Key Trade Documents and Data Elements (DSI WG KTDDE). The objective of this working group is to collect available standards for key trade documents and related data elements used in international trade by both the private and public sectors. The working group focuses on the development of Trade Document Information (TDI).

VI. Conclusion

69. Blockchain has unique characteristics that could potentially take the Digital Transformation of Customs to the next level. Its immutability features increase confidence in the use of electronic data by guaranteeing the authenticity of electronic documents and preventing data tampering. Its distributed architecture helps to make supply chain information more efficient by eliminating the need for intermediaries and improves data quality.

70. Considering the different possible use cases of blockchain implementation and taking into consideration some of the challenges noted above, the blockchain ecosystem helps to simplify and understand the use of blockchain by Customs in the context of existing digitalization initiatives, such as Single Window (national regulatory blockchain ecosystem) and GNC (cross-border regulatory blockchain ecosystem). The Commercial Supply Chain Ecosystem enables Customs to access the data required for border clearance directly from the source, beyond the traditional primary data provider, namely the declarant, thereby improving efficiency and data quality.