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Business processes and data interchange of electronic bill of lading based on distributed ledger technology (DLT)

Processus dans le commerce, l'industrie et l'administration et échange des données des connaissements électroniques basés sur la technologie des registres partagés (DLT)

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 154, *Processes, data elements and documents in commerce, industry and administration*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document has been developed collaboratively with the UN/CEFACT Transport and Logistics Domain, reflecting a thorough open development process that involved experts from both the public and private sectors within ISO and UN/CEFACT. This joint effort ensures the document is comprehensive, inclusive, and aligned with international best practices.

The bill of lading (B/L) is the core document in relation to the carriage of goods by sea, and it has three main functions:

— the goods receipt;

— the document of title;

— the evidence of the contract of carriage.

With the rapid advancement of computer technology, the Internet, and information and communication technologies (ICT), the electronic bill of lading (eBL) has emerged as a key method of electronic data interchange (EDI) in the global economy. In recent years, industry stakeholders have placed growing emphasis on the need for tamper resistance and distributed verifiability in eBL systems. In response, eBL solutions based on distributed ledger technology (DLT) have gained traction due to their inherent features such as immutability, traceability, and reliability. DLT-based eBLs (DLT eBLs) are well-aligned with traditional B/L processes and comply with relevant international regulations. By enabling secure and efficient electronic data exchange in maritime shipping, DLT eBLs represent a transformative step forward for the industry. Compared to conventional paper-based B/L, they offer numerous advantages, including enhanced data accuracy, improved security, greater operational efficiency, and increased environmental sustainability.

Traditionally, the issuance, transfer, and verification of B/L have been resource-intensive and time-consuming processes, often involving multiple intermediaries and manual handling. However, the adoption of DLT offers a transformative alternative. By enabling peer-to-peer transactions, DLT eBLs can significantly streamline these operations while maintaining robust information security and preventing document forgery. This decentralized and tamper-resistant approach not only enhances trust and transparency across the B/L lifecycle but also promises substantial time and cost savings for all stakeholders involved in the supply chain.

The B/L process involves a wide range of participants, including carriers, shippers [large companies and small and medium-sized enterprises (SMEs)], endorsers, endorsees, consignees [large companies and small and medium-sized enterprises (SMEs)], banks, freight forwarders, underwriters, terminal operators, customs authorities, maritime regulators, and other relevant stakeholders.

This framework promotes collaboration among key stakeholders to support the development, adoption, and integration of DLT eBL and its associated applications. By addressing existing inefficiencies and compatibility challenges, this approach delivers substantial value across the entire B/L ecosystem.

a) Standardized business process for DLT eBL

This document defines a standardized business process for implementing eBL using a digital platform, replacing traditional paper-based methods. It covers typical maritime B/L processes, including both straight B/L and to order B/L.

The digital platform enables the electronic transfer and endorsement of B/Ls in a controlled and traceable manner. While the DLT eBL process follows the conventional B/L workflow, it enhances operational control and provides end-to-end traceability throughout the distribution chain. This improvement supports secure custodian and seamless transfer among shippers, resellers, banks, and consignees.

b) Data requirements and interoperability framework

This document specifies the data requirements for transitioning from paper-based to digital B/L processes, in alignment with established industry standards. It also addresses the need for compatibility across different eBL platforms by standardizing data structures, elements, and semantics.

In the context of DLT eBL, customized or proprietary access models are discouraged, as eBLs are exchanged across diverse stakeholders and systems. Therefore, establishing consensus on data elements and their codification is essential. This document presents data requirements from two perspectives (see Figure 6):

— Document structure view: defines nine segments designated (B1-B9) based on the layout of traditional B/L (see Figure 7).

— Operational and functional views: includes the business operational view (BOV), which captures foundational B/L information, and the functional service view (FSV), which defines data elements required for platform-level services.

The semantic structure aligns with the UN/CEFACT "Buy-Ship-Pay" model and supports compliance with the UNCITRAL Model Law on Electronic Transferable Records (MLETR). It is also harmonized with the UN/CEFACT Global Bill of Lading (Waybill) subset within the Multi-Modal Transport Reference Data Model (MMT-RDM). Any additional data elements identified will be fully integrated into the MMT-RDM to ensure consistency and interoperability.

Data element mapping (refer to Clause 7) follows the terminology of the United Nations Trade Data Elements Directory (UNTDED/ISO 7372) and the UN/CEFACT "Buy-Ship-Pay" framework, supporting cross-platform eBL interoperability and providing a foundation for initiating eBL process on any compliant platform.

c) Trust framework and security mechanism

This document also outlines a trust framework for secure eBL exchange, leveraging DLT to ensure that access and control are governed by the title owner. By utilizing DLT's inherent capabilities, the system protects sensitive information, such as customer data, cargo details, and logistics flows, from tampering during eBL transfers.

Each eBL issued by a carrier is uniquely identifiable and fully traceable throughout its lifecycle. Blockchain, as a DLT implementation, supports this by using unique data fields to broadcast and record routing information across distributed ledgers during eBL processing. This ensures that the entire transaction remains under the control of the sender, with access restricted to authorized participants within the eBL ecosystem.

See Annex A for UML for B/L data exchanging.

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1 Scope

This document outlines the business processes and data requirements for the implementation of electronic bill of lading (eBL). Its primary focus is the secure digital transfer of title documents via a trusted platform. Additionally, it specifies optional data elements that are essential for leveraging distributed ledger technology (DLT) to support the eBL workflow.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
bill of lading
B/L
document which evidences a contract of carriage by sea and the taking over or loading of goods by the *carrier* (3.3), and by which the carrier undertakes to deliver the goods against surrender of the document

Note 1 to entry: A provision in the document that the goods are to be delivered to the order of a named person, or to order, or to bearer, constitutes such an undertaking (United Nations Conference of the Carriage of Goods by Sea).

Note 2 to entry: In certain countries, e.g., Canada and the United States of America, the term “bill of lading” is used to represent a “negotiable bill of lading”.

[SOURCE: United Nations Convention on the Carriage of Goods by Sea (Hamburg, 31 March 1978); UNECE/TRADE/377/Rev.3, 2019, 59]

3.2
holder
party for the time being in possession of the *B/L* (3.1)

Note 1 to entry: A holder can be:

a) A person that is in possession of a negotiable transport document; and

   1) if the document is an order document, is identified in it as the *shipper* (3.8) or the *consignee* (3.4), or is the person to which the document is duly endorsed; or

   2) if the document is a blank endorsed order document or bearer document, is the bearer thereof; or

b) the person to which a negotiable electronic transport record has been issued or transferred in accordance with the procedures (Rotterdam rules).