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THE TIME IS NOW: WIDESPREAD ADOPTION OF THE ELECTRONIC BILL OF LADING

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ABSTRACT

Much has been written about e-commerce in the shipping industry over the last ten years, especially about the electronic bill of lading. Although there have been commercially appealing providers on the market for over twenty years, there has been no real breakthrough recently towards the widespread use of the electronic bill of lading. It is true that the bill of lading is a document of title and therefore much more sensitive than many other documents used in maritime transport. On the other hand, it is true that this is not the only document of title on the market and that many others have long since been digitized. This paper is not limited to legal aspects, but also describes the technological aspects of blockchain in connection with the bill of lading. The authors believe that joint and coordinated work and mutual exchange of knowledge and experience between lawyers and technicians is the only way to achieve a successful broad introduction of the electronic bill of lading.

SUMMARY: 1. A Brief history of the Bill of Lading. – 1.1. Hard Copy Bill of Lading (BL). – 1.2. Electronic Bill of Lading (eBL). – 2. Some Features of Current Development of the Electronic Bill of Lading. – 2.1. The Issuer of the Bill of Lading. – 2.2. Use Cases of eBL. – 3. Blockchain Bill of Lading - How Does It Work. – 3.1. Blockchain. – 3.2. Technical Aspect of Transferring the Documents of title. – 4. Legal Challenges of the Electronic Bill of lading (eBL). – 5. The Approval of the International Group of P&I Clubs. – 6. Adoption of eBL. – 7. Conclusion.

1. *A Brief history of the Bill of Lading*

1.1. *Hard Copy Bill of Lading (BL)*

The development of the BL is associated with a lack of trust between the parties to the transport and sales contract, which is replaced by trust in the record. Initially, these were book records. Later, the document concerning the goods loaded on the ship for transport became independent. The trust which the participants gained

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through the record, that would later become the BL, becomes even more important when we remember that at that time there were no international instruments (international treaties) which offered a certain degree of legal certainty to the contracting parties. Correct data in the maritime cargo records soon proved to be extremely important, and all the more so as maritime transport in the Mediterranean increased. The seriousness and importance of the documents on board loaded goods was demonstrated by the requirement that the vessels had a special clerk responsible for keeping the registers of these goods. If this clerk made an incorrect entry in the register, they would cut off his right arm and mark his forehead with glowing iron, regardless of whether the entry was made incorrectly by him or by someone else. If the register was not in possession of this clerk, the information in the registry was not trusted¹.

As early as the middle of the 13th century, it was possible to find maritime legislation that enabled merchants to obtain an extract from the ship's book. At first, the function of this document was proof of the receipt of goods. These rules could be found in the statutes of Marseille 1253-1255, Ancona 1397, or Genoa 1441². There is also a statute of Sessari from 1316, which contains the document with the name *pulizza* (the similarity with the present Italian name for BL; *polizza di carico* is more than obvious), while the statute of Genoa brought *apodixia*, which later became the Latin name for a BL. The French *connaissement*, German *Konnossement* and the Spanish *conosçimiento* represent the other branch of the name of this document.

The first BL mentioned by Bensa³ was used for transport to Pisa on 25 June 1390. This first one and the second known BL had a consignee named and were therefore what today we call the straight BL. Nothing in these first documents indicate that the BL could be transferred to another person. *The Thomas* case is famous as the first preserved BL issued in the English language. That was in 1538⁴. Greif offers an interesting observation on why the Genoese traders used bills of lading and developed the latter and why Maghribi traders also knew the document but did not get excited about it and did not develop it. It seems that Maghribi were using rather *in personam* enforcement mechanism in comparison to the *in rem* (the record) was used in Genoa and the medieval European city-states. Maghribi merchants trusted other Maghribi traders who travelled by ship and loaded goods⁵.

The BL later got wind in its sails and was widely used throughout Europe in the

¹ R. AIKENS, R. LORDS, M. BOOLS, *The Bills of Lading*, Second Edition, New York, 2016, pp. 1-2.

² F. STEVENS, *The BL Holder Rights and Liabilities*, New York, 2018, pp. 10-11.

³ E. BENSA, *The Early History of Bills of Lading*, Genoa, 1925, p. 8. For the history of the bill of lading see also: W.P. BENNETT, *The History and Present Position of the Bill of Lading as a Document of Title to Goods*, Cambridge University Press, 1914.

⁴ F. STEVENS, *op.cit.*, p. 11.

⁵ A. GREIF, *Institutions and the Path to the Modern Economy*, Stanford University, 2006, p. 297.

16th century. The *L'Ordonnance de la Marine* of 1681 implicitly established the BL function of a receipt, and this was later explicitly confirmed in the *Code de Commerce*⁶.

In the second⁷ half of the 16th century another feature that is known today appeared: transferability. The provisions of transferability manifested themselves in two forms: (i) where the delivery of the goods to the shipper (or his agent or another type of representative) was specified or (ii) where the delivery was specified to a third person who would typically be the buyer or his representative). On some occasions, shippers most likely did not know who the consignee would be at the time the goods were loaded. The reason was not that the goods were to be traded, as is sometimes the case today when ownership of the cargo can change several times during the voyage. The consignee was simply not known at the time of issuing the BL and therefore could not be indicated on BL or in the vessel's register. The solution of this new reality was to make the BL the document that has incorporated the proof of entitlement.

The third function of BL - i.e., the evidence of the content of the contract - may also be dated back to the 16th century. Most BLs of that time did not contain any contractual provisions. Nevertheless, BLs could be found which contained provisions reserved for the charter-parties, with the majority of BLs containing a reference to the existing charter-party which regulated particular carriage of goods⁸.

There were two important cases⁹ in England, *Lickbarrow v. Mason* from the 18th century and *Newson v. Thornton* from the 19th century. In the case of *Lickbarrow v. Mason* what became clear was that the BL is recognized as a symbol of goods loaded onto a ship and that if the intention of the parties is that the property is transferred by endorsement from one party to the other, it is like actual delivery of goods. In *Newson v. Thornton* English jurisprudence went a step further, as in this case Lord Ellenborough, *obiter* though¹⁰ described the possession of a BL as the actual possession of the goods.

This "ancient" history of the BL created three features of the modern BL: (i) it is a document of receipt, (ii) it is a proof of the content of the contract of carriage, and (iii) it is a document of title. The subsequent "less ancient" history, gave us charted use of the BL in carriage for the 20th century and already for two decades of the 21st century. Shippers, sellers, charterers (cargo interest) and carriers (shipowners) were dissatisfied because their contractual partners (shipowners) through contractual autonomy bore almost no risk in the maritime carriage of goods. The Liverpool draft of the BL of 1882, the Hamburg Rules of Affreightment of 1885,

⁶ F. STEVENS, *op.cit.*, p. 12.

⁷ R. AIKENS, R. LORDS, M. BOOLS, *op. cit.*, p. 3.

⁸ *Idem*, pp. 4-5.

⁹ *Idem* pp. 9-10.

¹⁰ There are other cases, like *Sargent v. Morris* or *Patten v. Thompson*, in which the holder of a BL is not in actual possession of goods. See *Idem*, pp. 10-11.

the Harter act of 1893, all ran the trail to the Hague Rules¹¹ of 1924 and later the Visby Protocol¹² of 1968 that became a historical compromise between cargo interests and shipowners. Since the widespread acceptance of the Hague Rules carrier's liability should not be excluded by terms and conditions of carriage, on the other hand, the carriers received many benefits (limitation of liability, nautical fault, fault in case of fire, excepted perils).

1.2. *Electronic Bill of Lading (eBL)*

The Hamburg rules provided in 1978 for the possibility of electronic signature of a BL. This is not enough to issue an eBL, but it is a start. In any case, it is only since the 1980s that digitisation has made great strides in our lives and our companies. The CMI Rules for Electronic Bills of Lading are quite early as they were offered to the shipping industry by 1990. The value of the CMI Rules for the eBL is that of icebreaking and awareness-raising, not so much the actual application of the rules in practice.

UNCITRAL has done a great job here. Recognizing that the drafting of a new convention on the carriage of goods by sea was out of the question at the time, they approached the challenging issue differently. UNCITRAL's Model Law on Electronic Commerce 1996 and later Model Law on Electronic Signatures have provided a solid framework and a proposal for countries to legislate in this area. The Model Law on Electronic Commerce 1996 (MLEC), Article 16, regulated acts relating to contracts of carriage of goods and Article 17 even regulated transport documents. MLEC did a great job for electronic commerce in a broad sense. It has also brought out two important principles: originality and uniqueness.

An electronic document is original if its content has not been altered and it is unique if this document is the only one that exists and could be distinguished from eventual copies. Neither the Hamburg rules from 1978¹³ nor the recent Rotterdam Rules¹⁴ of 2009 have been widely accepted. The Rotterdam Rules in particular would answer many dilemmas that come with the use of an eBL¹⁵. Until eventually the EU decides to enact the Rotterdam Rules, as it has with the PAL protocol 2002, saving this latter from the ashes, the future of the Rotterdam Rules remains uncertain.

There was another important milestone in 2014. BIMCO adopted a *standalone*

¹¹ International Convention for the unification of certain rules of law relating to Bills of lading and protocol of signature is still the most widely adopted; nevertheless, many countries denounced being a party of the treaty.

¹² Protocol to amend the International Convention for the unification of certain rules of law relating to bills of lading, signed in Brussels on 25 August 1924.

¹³ United Nations Convention on the Carriage of Goods by Sea, 1978 has 34 parties.

¹⁴ United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea, currently 25 signing States. It has only five parties (Benin, Cameroon, Congo, Spain and Togo), while 20 actions are required for entry into force.

¹⁵ A. MOLLMANN, *Delivery of Goods Under Bills of Lading*, London & New York, 2017, p. 183 ff.

Electronic Bill of lading Clause for use¹⁶ in time, voyage charters, and bills of lading. The clause provides that at the charterer's option the bills of lading, waybills, or delivery orders referred to in the charter party in electronic form shall have the same effect as their paper equivalent, that charterers shall subscribe/use an International group of P&I clubs (IG P&I) approved system and that charterers agree to hold the shipowners harmless of additional liability for the use of an electronic system if such a liability does not arise from the shipowner's negligence. What one might find strange is that the clause stipulates in advance that the cost of using the electronic system will be that of the charterer. This rule is quite easy to implement if an electronic trading provider charges per issued BL. On the other hand, it is almost impossible if there is a subscription fee that the shipowner pays to the independent electronic¹⁷ trading provider. An interesting development has taken place. Despite the fact that some shipping lines have started to develop their e-commerce system for BL, independent providers seem to have a slight advantage in international trade. The main reason is probably that no shipping line wants to be dependent on its market competitor. In this light, the provision in the above-mentioned clause takes on an additional dimension. Since the introduction of electronic commerce would be welcomed by all players in the shipping industry, it is a pity to fix the cost burden in advance.

The most recent proposal drawn up by UNCITRAL is a Model Law on Electronic Transferable Records from 2017 (MLETR). MLETR establishes a legal framework for the validation of electronically transferable records¹⁸ and is based on several concepts¹⁹, as it is a concept of functional equivalence, technological neutrality and non-discrimination of foreign electronic transferable records. The concept of functional equivalence makes it clear that an electronic version of a traditional BL one is a reflection of the paper workflow. The core of the concept is that an eBL "shall not be denied legal effect, validity or enforceability on the sole ground that it is in electronic form"²⁰. The concept of technological neutrality is important in at least two respects: (i) it would be rather inconvenient and unfair if the model law were to prefer one technology over another, and (ii) as new technologies emerge in ever shorter periods, the rules would soon become obsolete. Non-discrimination of foreign electronic transferable records is a *conductio sine qua non* because of the international character of shipping industry. At the time of preparation of this paper, only one state (Bahrain) had adopted a law based on the MLETR. If the MLETR was to achieve the same adoption rate as the MLEC, this would be a good acceleration for the eBL.

¹⁶ B. SOYER, A. TETTENBORN, *International Trade and Carriage of Goods*, New York, 2017, pp. 148-150.

¹⁷ See also B. SOYER, A. TETTENBORN, *Op. cit.*, p. 151.

¹⁸ H.D. GABRIEL, *The UNCITRAL Model Law on Electronic Transferable Records*, Unif. L. Rev., Vol. 0, 2019, pp. 19-20.

¹⁹ UNCITRAL Model Law on Electronic Transferable Records, New York, 2018, pp. 7 ff.

²⁰ J. HERD, *Blocks of Lading' Distributed Ledger Technology and the Disruption of Sea Carriage Regulation*, QUT Law Review, Volume 18, General Issue 2 p. 315.

2. *Some Features of Current Development of the Electronic Bill of Lading*

2.1. *The Issuer of the Bill of Lading*

Issuers of eBLs could be the same as per hard copy BLs. The answer to the question whether the providers of eBL platforms must ensure that “Know your customer” (KYC) is guaranteed for onboarded issuers is negative. There is no reason for the eBL system to differ from the paper-based BL workflow in this respect. On the other hand, everyone who joins a particular platform is obliged to join agreement as the whole eBL system is based on the contractual autonomy of the parties involved.

In principle, the question of the issuer seems quite innocent: the issuer should be the person who undertakes to transport goods. The safest thing to do would be to call him/her a carrier. In practice, there are at least these most important types of BL dependent on the issuer: (i) master and (ii) house BL. The master BL is usually issued by a shipping line that actually carries out (with its ship or a chartered ship) the carriage of goods. The BL is issued in physical form by the shipping line, its affiliate, its agent and, increasingly rarely, the master. It has become a practice that the shipper is also the actual issuer of the BL, or, to put it more accurately: bills of lading could be printed at the shipper's²¹ premises. The reason for this is to save time and initial costs, since issuing the BL is both time-consuming and costly (e.g., courier service). Such an issuing of the BL would be subject to a special arrangement to achieve legal certainty. This would include special terms and conditions for this remote issuing of BLs, special software, electronic signatures and separate digital signature certificates for each computer and browser and printing on official carrier paper, often printing directly, and only via the print function of the software. One could also find a rule that says that if there is a difference between the printed and the electronic version, the latter takes precedence. It is not necessary to point out that this rule does not apply to third parties who rely on the paper²² form BL. Such a question would only be possible in a legal environment where an original (manual) signature is not required as part of the title document. Indeed, in some countries, when stocks were still in paper form, the signature would usually be a facsimile signature. At the same time, this could not be the case for an individual, non-serial²³ document of title. Practical experience will show whether there is also a need that in some cases when an eBL is issued a shipper would be an issuer.

²¹ N. GASKELL, *Bills of lading in an electronic age*, in *Lloyds Maritime and Commercial Law Quarterly*, 2010, 2, p. 253.

²² *Ibid.*, p. 254 (Gaskell is describing Maersk system).

²³ The Obligation Code of Slovenia in Article 213 demands the signature of the document of title and allows facsimile signature of the issuer of the document of title issued in the series. The Maritime Code of Slovenia as *lex specialis* allows in Article 502 that a signature may be in handwriting, printed in facsimile, perforated, stamped, in symbols, or made by any other mechanical or electronic means. This is the exact wording as Article 14/3 of Hamburg rules.

The house BL would usually be issued by a Non-Vessel Operating Common Carrier²⁴ (NVOCC), freight forwarder or a multimodal/logistics service provider. In principle, the house BL for certain goods should be identical to a master BL in terms of vessel origin and destination, quality and quantity of goods, but should differ in terms of who the shipper is, the consignee and notify address. It is also unthinkable that for the same goods carried under the master BL and the house BL, the master BL would be negotiable.

Identification of the issuer is important because in principle it will be he/she who will issue the eBL. Today we are far from the system when the BL was only issued by shipping companies. Crucially, a carrier, whether contractual or actual, should be able to issue an eBL.

2.2. Use Cases of eBL

Pioneering work in eBL systems has been done by the BL Electronic Registry Organization - Bolero²⁵. The Bolero describes its solutions not only as an electronic version of the electronic version of paper BL but as a combination of legal rulebook and technology that can replicate the functions of the traditional paper BL. The main features of the Bolero are (i) the Rulebook, which represents an agreement among users, (ii) the Title Registry as a repository and application for the transfer of the BL and (iii) the Messaging platform as a common infrastructure for all Bolero solutions.

essDOCS describe themselves as pioneers of paperless trade. Founded in 2005, the company offered the BL a system called CargoDocs eB/Ls in 2010, which is based on paper processes. CargoDocs is a web-based platform. The digitalization, creation and approval of electronic original documents is done via DocHub and the exchange and legal transfer via DocEx²⁶.

The e-title solution is a legal framework that provides contractual validity through a multilateral agreement to title transfers. Title transfers are made possible by peer-to-peer technology without central registers. Operational control over title documents is achieved by the service provider or a national platform. The e-title also provides a mechanism for managing potential disputes between the parties involved.

The edoxOnline, WAVE and CargoX are the second generation of electronic trading system providers. They are all, in one way or another, using the benefits of blockchain technology.

The edoxOnline is a product of a company that was established in 2007. Its aim is to provide the industry with a collaborative digital platform to streamline the issuance of shipping and commercial documents. edoxOnline's system connects all

²⁴ For the rise of the NVOCC see: D.A. BURY, *Electronic Bill of Lading: A Never-Ending Story*, 41 Tul. Mar. L.J. 197 (2016-2017), pp. 206-208.

²⁵ Only the IG P&I approved trading system providers are mentioned in the paper.

²⁶ It represents a cloud-based solution that enables the electronic signing, exchange, and legal transfer of title documents.

the participants in a trade. The legal framework for the system are eBL Terms and Conditions.

WAVE uses a distributed ledger network using blockchain technology to enable the parties in carriage and sales contract to issue, exchange, and sign different documents in the supply chain. They do not use a central server or registry. The system follows in its terms and conditions the process for transferring title under the Carriage of Goods by Sea Act 1992. WAVE is the second system approved by the IG P&I to use Blockchain technology and the first to be fully decentralised.

The CargoX created the first blockchain eBL²⁷ in history. It was in August 2018 for the shipment of a container from Shanghai, China, to Koper, Slovenia. The CargoX platform enables blockchain document transfer (BDT), and the company aims to build digital trust between trading companies in a mistrusting digital environment. CargoX is using the public Ethereum blockchain and already supports solutions for many industries where sensitive documentation needs to be transferred securely, quickly and efficiently. Nevertheless, their main focus remaining on the shipping industry.

3. *Blockchain Bill of Lading - How Does It Work*

3.1. *Blockchain*

Since the rise of the internet, digitalization has slowly been creeping into our lives. Blockchain seems to be “the next big thing”, and some even view it as technological²⁸ revolution²⁹. Different industries have been adapting to this new infrastructure at different paces. We can even detect the rise of the blockchain in some quite traditional business (diamonds, precious minerals, and gems)³⁰. In general, blockchain implementation may be public, private or semi-private (consortium based)³¹. While the latter two do have specific use cases, they are not suitable for the international transfer of documents of title, as they lack decentralization, transparency, and traceability. Access to these blockchains can be restricted by a central authority. Therefore, from hereon, the term blockchain refers to public blockchains only.

²⁷ Commercial name is Smart B/L™.

²⁸ D. TAPSCOTT, T. ALEX, *Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies Is Changing the World*, London, 2016, p. 241.

²⁹ M. METTLER, *Blockchain technology in healthcare: The revolution starts here in 2016 IEEE 18th International Conference on e-Health Networking, Applications and Services (Healthcom)*, Munich, Germany, 2016, pp. 1-3

³⁰ L. CARTIER, S. ALI, M. KRZEMNICKI, *Blockchain, Chain of Custody and Trace Elements: An Overview of Tracking and Traceability Opportunities in the Gem Industry in The Journal of Gemmology*, 2018, London, UK, pp. 212-227.

³¹ Z. ZIBIN, X. SHAOAN, D. HONGNING, C. XIANGPING, W. HUAIMIN, *An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends*, IEEE 6th International Congress on Big Data, 2017, Honolulu, HI, USA, 2017, pp. 557-564.

Aste et. al³² define blockchain as simply “a technology that uses community validation to keep synchronized the content of ledgers replicated across multiple users.” This represents the first important feature of blockchain – (i) *data is distributed, decentralized³³, and replicated by nature*. There is no single point of failure (SPOF) for the blockchain.

Blockchain records are persistent and final. Aste et.al³⁴ describe them as “a shared, tamper-proof replicated ledger where records are irreversible.” M. Crosby et. al³⁵ simply says blockchain records are immutable. This is the second relevant feature – (2) *once recorded on the blockchain, it's impossible to change the data*.

Another important aspect is that blockchain records are (3) *transparent and traceable³⁶*. Anyone with access to the blockchain can view the records and record history.

While many different blockchain networks exist today, the most popular ones seem to be Bitcoin and Ethereum. BitCoin, as the first blockchain, was launched in 2009, after a paper published by an individual/or individuals only known under the alias Satoshi Nakamoto. Ethereum was launched in 2015. Ethereum popularized the concept of distributed applications (sometimes abbreviated as dApp or dApp), which are composed of classical graphical frontend, and smart contracts on the blockchain itself. Smart contracts rely on the cryptographic and immutability properties of the blockchain to execute code on the blockchain in a distributed and deterministic matter, which means that (4) *smart contracts are an essential part needed to support a digital transfer of the B/L*.

All blockchain interactions rely on the use of public key infrastructure (PKI). Private keys enable the user to access and interact with his/her wallets, while the public part is used to calculate the address of the wallet. This allows only the holder of the private key to execute any (outgoing) transactions on the wallet. This means that (5) *only the holder of the private key can initiate the transfer of a document of title*.

3.2. Technical Aspect of Transferring the Documents of title

Ethereum has many “standards”. Ethereum Request for Comments – ERC³⁷ – which define how smart contracts should behave. One of the most well-known is ERC-20, which defines how to implement your own tokens on top of this blockchain.

³² T. ASTE, P. TASCA, T. D. MATTEO, *Blockchain Technologies: foreseeable impact on industry and society*, IEEE Computer, vol. 50, no. 9, London, UK, 2017, pp. 18-28.

³³ F. TIAN, *An Agri-food Supply Chain Traceability System for China Based on RFID & Blockchain Technology*, International Conference on Service Systems and Service Management (ICSSSM), vol. 13, Kunming, China, 2016, pp. 1-6.

³⁴ T. ASTE, P. TASCA, T. D. MATTEO, *op. cit.*, pp. 18-28.

³⁵ M. CROSBY, NACHIAPPAN, P. PATTANAYAK, S. VERMA, V. KALYANARAMAN, *BlockChain Technology: Beyond Bitcoin, Applied Innovation Review*, no. 2, Berkeley, CA, USA, 2016, p. 16.

³⁶ T. ASTE, P. TASCA, T. D. MATTEO, *op. cit.*, pp. 18-28.

³⁷ Ethereum Improvement proposals are conceptualized after the Internet's RFCs (Request for Comments). They define standards/suggestions for the improvement of the Ethereum network. They range from low-level network changes to interfaces certain smart contracts should adhere to.

This standard is then extended by ERC-721, which defines *non-fungible* tokens. These tokens are unique – each token represents its own entity and is not interchangeable. This creates a perfect platform to represent the eBL.

Each stream of bytes, including any digital documents, can be uniquely identified by its hash code – a checksum, calculated through a well-known algorithm. To earn the name “hashing algorithm”, it needs to satisfy the following criteria: (i) the output changes significantly, even if any single byte is changed or swapped, (ii) it must be impossible to deduce/recreate the input document from the final result. Many such algorithms exist today and range within checksum code length (from 1 to 512 bits or more) and requisite standard resistance to collision attacks³⁸. Since Ethereum relies on 256-bit Keccak/SHA-3³⁹ for hashing, it makes sense to use the same algorithm here. Paired with ERC-721, each eBL can therefore be safely represented as an ERC-721-compatible token, which includes a SHA-3 hash of the uploaded (binary stream) document.

Such a token has the following features: (1) *It uniquely represents a specific document (BL)*. Any other document would yield a different checksum code. As records on the blockchain are immutable, one can be certain that the code hasn't been altered. Anyone holding the copy of the original document can verify that the token refers to the document by calculating the checksum code themselves. (2) *Ownership of the document is public and well-known*. As records on the blockchain are traceable and transparent, so the current holder of the document, as well as previous holders, can be verified from the public records⁴⁰. (3) *The document can easily exchange hands*. Tokens may be sent to other users (addresses)⁴¹ by standard blockchain mechanisms. Only the holder of the private key can transfer such a token. (4) *The document cannot be lost*. As the token is stored on the blockchain itself, its location is known at any point in time. (5) *The document cannot be stolen during transport*. Documents change hands instantly⁴² and can only be transferred forward by the holder of the private key. Potential risks (and cost associated with) with lost or stolen documents are therefore significantly minimized.

To create a new token, a smart contract implementing ERC-721 is needed. The user calls a method on the smart contract, including the checksum code of the

³⁸ A collision attack is the probability of finding (another) stream of bytes satisfying the same checksum/producing the same hash code. Collision attacks are outside of the scope of this paper. It is sufficient to say that the longer the checksum is, the less likely accidental collision. At this time, SHA-3 range of hashing algorithms (and especially SHA-3) are deemed “non-attackable” by conventional means.

³⁹ Technically, SHA-3 is a subset of the Keccak family of hashing functions, but for the purpose of this paper, we can treat them as one and the same, as there's no difference in collision-attack prevention and/or the number of bits.

⁴⁰ Blockchain introduces an additional benefit: the record of the history of holders, which is impossible to do with paper documents.

⁴¹ Ethereum refers to such addresses as *externally owned account(s)*.

⁴² The transaction is “atomic” – the document is either completely transferred or not at all. It cannot be “in transit” at any point in time.

document. The smart contract, in return, deposits the token representing the document into the user's wallet and thus an eBL is born.

The token may now be freely transferred between different parties. The current holder of the document executes a method on the smart contract – using his/her private key – and deposits the document in another wallet/transfers the document forward.

A token can be made inactive/finalized by a *smart contract* for various reasons: the workflow may complete successfully, or the token needs to be rescinded for other reasons (e.g., a replacement BL needs to be issued or the document needs to be converted into a paper form). Again, the current holder interacts with the *smart contract* and orders the transition using his/her private key. The *smart contract* can, and in fact should, check whether conditions match (for example only the issuer may rescind the token or whether the token has already been finalized). If they do, it executes the action and records the final result on the blockchain.

For example, here is an example of a checksum created using a 256-bit SHA-3 hash calculator. This is a hash that could be recorded on the blockchain for the title of this paper (obviously we could create one single hash for the whole paper):

The Time is Now: Widespread Adoption of the Electronic Bill of Lading
889a81c208cb6b807eaf1eab23f6e6847ba8cbc07db97b12ff1e6ac46c92d338⁴³

If we change just one letter or symbol, for example if we used a semicolon instead of a colon, the resulting checksum is completely different:

The Time is Now; Widespread Adoption of the Electronic Bill of Lading
322fd469ffc17a5be2d2f567190662857035ce3ba11a080125ab1abead05fdc

The same holds true for the eBL. If one single letter or number is changed on, or in relation to, an eBL, one would immediately be able to detect the fraudulent document. Of course, the checksum is always calculated from the whole document and not just the title, as in the example above.

4. *Legal Challenges of the Electronic Bill of lading (eBL)*

There are two main questions: (i) is it possible to achieve functional equivalence of the paper BL with eBL and (ii) is digitisation - i.e. the mirroring of the paper process - an adequate response to the possibilities offered by information and communications technology (ICT).

Two functions of the BL – i.e., the BL as a receipt for the goods shipped and as proof of the content of the contract of carriage – are not a challenge for the eBL. The main legal challenges are related to the fact that being a negotiable document of title the paper BL embodies the goods that are loaded onto the ship. The transfer of the paper document could be called *longa manu traditio*⁴⁴, by endorsement (to order

⁴³ Checksums are stored as a stream of bytes. As not all bytes correspond to printable characters, they are usually converted to base-16 (hex) encoding for representation, where every byte is represented by two characters. This string is in fact 256 bits/32 bytes long.

⁴⁴ A.V. ZIEGLER, *Transfer of Ownership in International Trade*, 2011, Alphen aan den Rijn, 2011, p. 309.

BL), or simple tradition (to bearer BL), is a legal fiction that the goods have been transferred from one person to another without moving physically and that the actual lawful holder is entitled to demand the delivery of the goods in the port of destination. The electronic trading system providers must be able to reflect the transfer of a paper document from the current holder to the next holder. eBL, as it is an electronic document, must be one and only one and entail the guarantee that nobody can change its content. The technical part does not seem to be too much of an obstacle. In particular, the blockchain technology ensures two main features required for the electronic document; i.e. that the electronic document is: (i) original - which means that the document has not been altered since it has been issued, and (ii) unique - which means that only one or a designated number of copies of such a document exist⁴⁵.

There are other legal challenges that currently seem intricate. For instance, how to ensure that all contracting parties and others involved in the use of the eBL accept the eBL. The issuer (carrier), shipper, seller, buyer, seller's bank, buyer's bank, exporter, importer, insurance company, authority (customs) - all these entities should accept the eBL, which would replace the paper document. Therefore it is not only B2B⁴⁶ involvement but also B2G. The solution to the first challenge is contractual autonomy: if the carrier and the shipper, as well as all eventual endorsees and other B2B recipients, agree to the document BL being issued in dematerialised form, then this should be accepted as their right, inherent in both common law and civil law countries. The BL is a private document and the autonomy of parties of the contract should be interpreted *lato sensu*. There could be a restriction in some local laws that would be unfriendly to eBL that would, for instance, explicitly demand a BL in the form of a paper document. On the other hand, we are deep into the 21st century and many countries have adopted classic e-commerce principles. One⁴⁷ of them is the prohibition of discrimination of electronic against paper documents. The second challenge, the B2G transfer, could prove to be a significant inhibiting factor at this stage. There are some countries where customs require original paper BLs. The solution would be to adopt a law laying down the legal rules for transferable electronic records. As has already been mentioned, there are at least two ways of tackling the problem of affection for the tradition of paper-based business: (i) broad adoption of the Rotterdam Rules or local legislation based on or similar to the MLETR rules. It is also true that all described use cases in this paper support the function of transformation of eBL into paper BL. This feature, though, should not be a solution to restrictive governmental decisions on BL as a private law document.

There is also the question of exclusive control of the BL. The answer is easy for

⁴⁵ P.L. UNHO, *UNCITRAL Model Law on Electronic Transferable Records: Another Failure of Facilitator for the Use of Electronic Bills of Lading?*, in Vol. 5: *Port Maritime and Transport Law, Between Legacies of the Past and Modernization*, 2010, 2, p. 595.

⁴⁶ B2B is business to business; B2G is business to government.

⁴⁷ UNCITRAL Model Law on Electronic Commerce Guide to Enactment with 1996 with additional article 5 as adopted in 1998, New York, 1999, pp. 31, 34, 48.

the paper original(s) as the lawful holder has physical possession of tangible object(s)⁴⁸. Physical possession of an intangible electronic record is a concept that has yet to be absorbed by our paper-based minds. It is essential that possession of an eBL original is an electronic equivalent of physical possession of a paper BL with only one holder at a time. In Europe and elsewhere many are used to e-banking. It is clear that the money in our account is not the paper money in our safe, for example. The same principle could *mutatis mutandis* be applied to the eBL, with the difference that money is a *genus* and the BL a *species* (not necessarily the goods that are incorporated into the BL but the BL as a document). People have adopted the concept of electronic money quite smoothly. The same should be done with the concept of the eBL. There are intelligible technological solutions which show that the current holder of the eBL is only a specific legal or natural person.

Digitalization of existing paper-based processes should be just the first step of introduction of e-commerce into the shipping industry. Even though it will make all the processes of the paper BL faster, safer, and cheaper it represents a tiny manifestation of ITC potential. We believe that a completely new workflow should be introduced soon. In our view the multidisciplinary approach, connecting lawyers, people from the shipping industry and IT people, will enable the offering of a new paradigm. You could boldly argue that paper money is completely unnecessary these days in many countries. The same is true of the paper business in the shipping industry as we have known it for many centuries.

5. *The Approval of the International Group P&I Clubs*

The IG P&I approval⁴⁹ is the only existing standardisation for a paperless system of the BL offered by electronic trading system providers. There is no other governmental (international) or private international organisation that would issue any kind of certification for electronic solutions for BL. This is rather logical due to the reason that (i) the BL is a private law document and (ii) the bill of lading's role in international trade. Until February 2010, the rules of all the IG P&Is specifically excluded liabilities in respect of the shipping of cargo under all electronic (paperless) trading systems. In February 2010 the first IG P&I approval for an eBL was issued. The maiden system was Bolero. In 2013 essDOCS and later in 2015 e-titleTM were approved. As if something might be in the air, maybe the smell of paperless business, in the last short period no less than three systems obtained this standard recognition. The last three second generation systems that got such approval are edoxOnline platform on 11 June 2019, WAVE on 23 December 2019, and CargoX on 11 February 2020.

⁴⁸ P.L. UNHO, *ibid.*, p. 596.

⁴⁹ There are also other systems that are significant on the market but do not enjoy the IG P&I approval, such as the TradeLens by Maersk and IBM or the Bill of Lading paperless by CMA CGM.

To acquire the IG P&I approval, a paperless BL solution has to prove that the eBL can fulfil all three functions of its paper sibling. The company that desires its system to receive approval has to answer a questionnaire. The system must enable a transfer of title, rights, and liabilities; i.e., it has to enable the endorsement. The parties have to agree that an electronic signature is a valid one and that they agree not to dispute that the electronic bill is a BL. There must be a mechanism that enables the capacity to sue and to be sued. The trading system provider has to ensure that treaties, conventions, and national laws which ordinarily apply to a paper BL are applicable and must allow for clausing, accomplishment, and rejection of the eBL. There must also be sufficient evidence of the terms of the contract of carriage. The trading system provider must accept liability in case of system failure and provide insurance of their liability of an adequate limit to cover liabilities arising from system fault or failure of any nature. There is also a demand that the system expressly excludes the application of the Contracts (Rights of Third Parties) Act of 1999 and is able at any time to convert the eBL into paper BL.

A working group of electronic commerce of IG P&I is a hard negotiator. Still, once the approval is issued, P&I clubs members can be sure that (i) P&I will cover a member's eventual liability and that the system is compliant with functions that have for centuries been reserved for paper BLs.

6. *Adoption of eBL*

The shipping industry is conservative in terms of e-commerce. As in the 19th century and the beginning of the 20th century when the power of the shipping industry was in rather coordinated action as per exclusion of liability in maritime transport, in the present-day shipping companies are, at least in transport of containers, a very small and cohesive group in comparison to other cargo interests. The five largest container carriers have two thirds of market share. This fact means that when the big ones decide that they go will "full electronic" the others will have to follow or they will perish. In this case even the subjects with usually more decision-making power- i.e., banks - would have to follow.

The other accelerating or inhibiting factors will be the position of authorities (maritime, customs) and the legal environment⁵⁰ around the globe. Due to Covid-19

⁵⁰ S. TRICKS, R. PARSON (CLYDE&CO), *The Legal Status of Electronic Bills of Lading, A report for the ICC Banking Commission*, London, 2018, pp. 17-56. The question for different jurisdictions in this study was about local jurisdiction being familiar with the electronic BL and whether the electronic BL enjoys the same legal status as paper BLs. England: English law does not grant the eBL the same legal status as the paper BL. The transfer of a BL is effective if parties agree on a contractual arrangement based on P&I clubs systems. USA: a federal statute, the Electronic Signatures in Global and National Commerce Act (ESIGN Commerce Act), 15 U.S.C. §7001 et seq. from 2009, provides a general rule of validity, effectiveness, and enforceability for electronic contracts and other records. Brazil: eBL enjoys the same status as the paper BL but it has to be registered in the Federal Revenue System. It has been made more for tax reasons and for shipping among Brazilian ports. United Arab Emirates (UAE): a negotiable eBL is not recognised by UAE law. Singapore: the position of Singapore is the same as in England. Germany: electronic BLs do

ICC in its invitation “ICC provides guidance to the trade finance market to address COVID-19 disruptions” from April 2020 is calling on governments and central banks to immediately void the legal requirement for paper-based documentation, and to adopt the MLETR. Many countries (e.g., India⁵¹) are now actually thinking of e-commerce in shipping as it is clear that the technology is adequate and that the eBL has many advantages over paper BLs (speed, price, safety). The safety feature may be insufficient from the point of view of the sworn paper users, but in particular the decentralised ledger using a public blockchain is rather immune to the imminent perils of e-commerce.

Larger adoption of the eBL will also demand an interoperability of trading system providers. The Rotterdam Rules and MLETR already do and any other local laws should also promulgate technical neutrality and interoperability. Any other way would be just another inhibitory factor for e-commerce’s vast acceptance. There is another challenge that does not exist in paper based trade and that will have to be tackled soon. E.g., if a shipper would like to endorse the eBL from one trading system provider to another, the systems will need to be able to communicate with each other.

7. Conclusion

The feature of all the IG P&I approved paperless systems is that they replicate the paper documentation process and workflow. These paperless systems can do the job without any doubt. It remains an open question what the next step should be. All these systems offer something new, something perhaps a step beyond the staid, centuries old process now generally still in place, something that would perhaps go beyond the BL, waybill or delivery order. A meta data could be used to create a totally different, holistic and effective paperless system that would accompany goods from the time of final production at the seller’s warehouse, through the shipper, the carrier, all the way to the consignee and buyer. Data capture for certain cargo (containerised, bulk or any other) could be used already from *ex works* all the way until it reaches the final buyer. The technical ITC solutions appear limitless. The change would be vast, but nevertheless using ITC to reflect the paper trail seems at this point less than an ambitious task.

not (yet) exist under German law. Netherlands: Dutch law does not recognise the eBL and does not yet have eBL rules. India: there are no provisions or precedent that would show that Indian courts are familiar with the eBL. However, as mentioned *supra* the Indian government as per 2020 started actions to introduce e-commerce. Russia: Russian law does not regulate eBLs, but there are general rules for paperless securities. Registration (made by a third party, non-participant to carriage relationships) is obligatory. China: In Chinese law there is no obstacle for the eBL; however the role of the eBL is still vague. The position of German law is described differently by: M.L. HENDRIKSE, N.H. MARGETSON, N.J. MARTETSON, H.P.A.J. MARTIUS, *Aspects of Maritime Law: Claims Under Bills of Lading, Chapter 13, The Electronic Bill of Lading*, Alphen aan den Rijn, pp. 315-318 (the German Commercial Code provides in § 516 section 2 a legal basis for the use of eBL. It has to be guaranteed that the authenticity and the integrity of the record are secured).

⁵¹ In the middle of April 2020, the Shipping Ministry and Commerce Ministry of India issued an advisory to the shipping industry, customs, and Banks Association that they are to accept «electronically generated trade documentation».

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