

Digital Business

Blockchain for Trade Finance: Trade Asset Tokenization (Part 3)

A lack of visibility into in-transit shipment and documentary delays increases costs and business risk for trading parties. By tokenizing the trade asset on blockchain and digitally managing trade documents, organizations can obtain delivery assurance and improve risk management for buyers and sellers — while also preventing losses due to document manipulation and errors.

Executive Summary

The commercial, legal, financial and insurance documents that accompany goods transported in international trade are vital for ensuring correct and timely delivery, facilitating the transfer of rights and obligations between buyer and seller, and conferring ownership or custody of goods. The most crucial of these documents is the original bill of lading, which acts simultaneously as a receipt of shipped goods, evidence of the contract of carriage between the shipper and the carrier, and as a title to the goods.

In this last role, a negotiable bill of lading represents the ownership of the consignment of goods and obliges the carrier to deliver the goods to the document's possessor. However, limited process oversight and logistical complexities in the shipment transport process result in several inefficiencies in both the movement of goods and in the issuance and transfer of trade documents like the bill of lading.

In this white paper, the third¹ in our five-part series on how blockchain can improve trade finance, we provide a deep dive into how blockchain technology can improve the security and reliability of trade transport through asset tokenization and digital issuance and transfer of trade documents to provide delivery assurance to trading parties. (For more information, see "[How Blockchain Can Revitalize Trade Finance \(Part 1\)](#)" and "[Blockchain for Trade Finance: Payment Method Automation \(Part 2\)](#)".)



Current process challenges

The complexities in trade facilitation emerge from the lack of harmonization and coordination challenges between parties due to the fragmented nature of the industry, as well as the need for multiple touchpoints to manage regulatory, financial or operational procedures across the transport chain.

These mechanisms increase the inefficiencies in the exchange of documents, information and goods among supply chain participants, raising the delivery risks and costs for the buyer (see Figure 1).

Delivery risks due to insufficient shipment visibility

For the buyer, it's essential to gain visibility into the status of in-transit shipment, both to estimate the delivery date and to obtain timely indications of potential delays and damages, which can impact fulfillment of downstream obligations. However, in most cases, the importer is notified of the arrival of goods only a couple of days before the shipment reaches the destination port. For example, an ocean freight carrier

Trade Transport Pain Points

A lack of visibility into the flow of goods and trade documents increases delivery risks and costs.

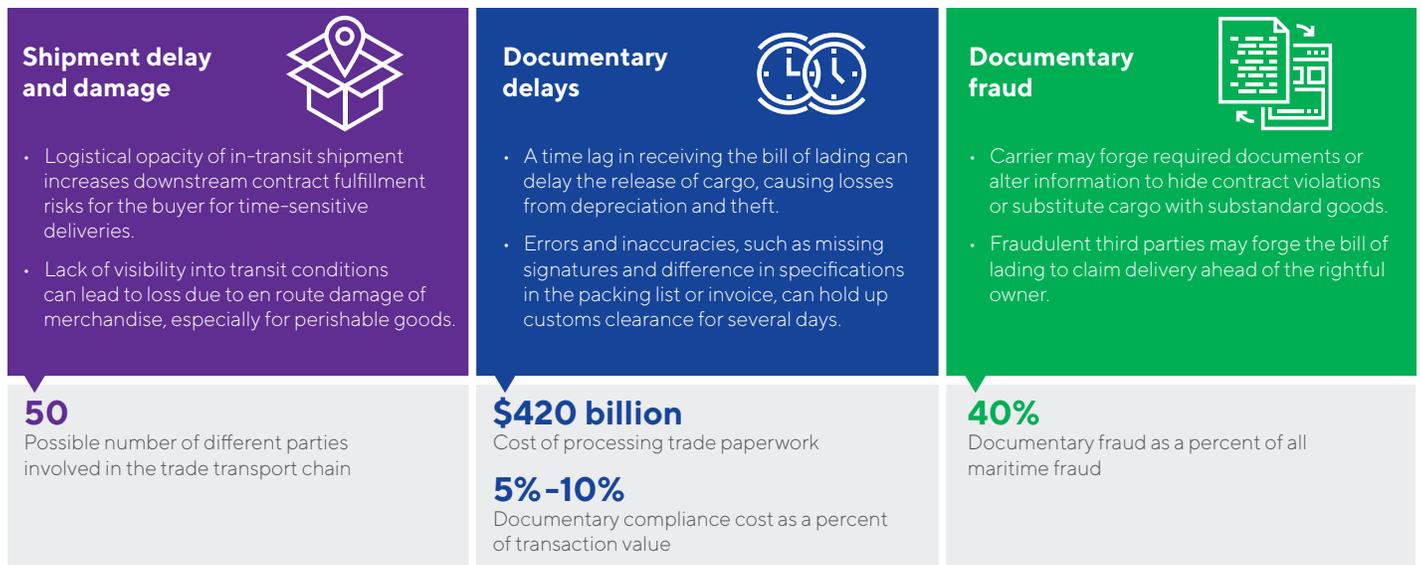


Figure 1

might send a cargo arrival notice, providing shipment information and the documents required for customs clearance and pickup at a destination port. Consequently, importers have no awareness of en route delays or shipment damage caused by bad weather, port congestion, route change or other factors until delivery.

Similarly, importers also lack timely insight into delays or losses in customs clearance at originating ports due to incomplete documentation or, in worst-case scenarios, theft or containers being docked at the wrong destination or getting lost. Such delays could seriously limit importers' ability to foresee and mitigate business risk, resulting in substantial business impact.

In addition to visibility into the geographic location of the shipment, the ability to monitor shipping conditions is also important in freight shipments. In the case of perishable or temperature-sensitive merchandise such as fresh flowers or wine, deviations from the required shipment conditions (i.e., temperature, ventilation or humidity control) can increase the chance of spoilage. A health or phyto-sanitary certificate from the port of origin can certify only that the shipment was in good condition and free from disease prior to shipment. Similarly, an inspection at the port of destination might not be able to determine the long-term effects of improper transport conditions on the quality of the shipment in all cases. From the buyer's perspective, this lack of visibility into transit conditions presents a substantial business risk.

Increased costs due to documentary inefficiencies

Another pain point in trade finance is the cost and delay in the flow of trade documents. The creation and verification of commercial, financial, regulatory and insurance documents required for international trade can involve as many as 50 different parties,² including importer, exporter, facilitating banks, freight forwarder, carrier, insurer, port operator, chambers of commerce, customs authorities, inspection companies and other regulatory agencies, each responsible for issuing, authenticating and modifying numerous trade documents. Studies estimate the cost of processing trade paperwork at USD \$420 billion³ annually and, in some cases, up to 5% to 10% of the total value of the trade transaction.

Trade documents also move separately from the flow of goods, which can result in buyers being unable to claim goods until the physical documents have been received. This includes the bill of lading, which as a title document is needed by the seller or the final possessor to claim delivery from the carrier.

As a result, there can be a time lag in receiving the bill of lading or other documents (such as an invoice) required for customs clearance, which can delay the release of cargo to the buyer, increasing the costs and risks of delivery. Even simple errors, such as missing signatures, a difference between the weights specified in the packing list and in the bill of lading, or differences between the consignee's address in the shipping manifest and on the commercial invoice, can lead to customs delays for several days. For the importer, delays in claiming the cargo due to either late arrival of title documents or customs issues can lead to additional demurrage costs charged by the shipping line, as well as storage charges levied by the port, and losses from the tying up of the inventory and possible depreciation in the value of perishable goods.

By tokenizing the trade asset, its transfer between trade transaction participants on a blockchain network can be conducted in parallel with the movement of the physical asset, establishing a clear chain of asset provenance.

Additionally, depending on the incoterms, any damage to the shipment during this period can also become the liability of the importer. Other documentary issues like a missing certificate of origin or a “claused” bill of lading from the transporter require further discussions between trading parties and need to be known and agreed to in a timely manner (i.e., typically when they are issued and not when they are presented for payment).

Loss from documentary fraud

Yet another concern is documentary fraud, which takes place when vulnerabilities in the transport chain are exploited to wrongfully indemnify the fraudulent parties. Numerous factors make it easy for fraudsters to manipulate documents, including operational complications resulting from the fragmented interactions between stakeholders, widespread variations in country-specific regulations and trade procedures, complete reliance on the document trail for decision making and an overall lack of security and common standards. It is estimated that approximately 40%⁴ of all maritime fraud relates to documentary fraud of some kind.

Fraud can take several forms, including forging of required documents, altering information in the original authentic documents for clearing customs, hiding contract violations or simply substituting valuable cargo with substandard goods. For instance, the exporter might load the cargo later than the date specified by the payment contract to avoid peak season surcharges but pre-date the bill of lading to meet the timing conditions of the contract, which can result in delayed delivery for the importer. In another scenario, a fraudulent third party may forge a bill of lading and claim delivery of shipment at the destination port by presenting the bill of lading ahead of the importer. Such problems occur because the buyer or financing bank have no visibility into transport operations and must trust the importer and carrier to properly manage the transportation of the merchandise.

Prior attempts to make title documents such as bill of lading paperless through telex release, electronic titles and trading systems have faced several security and technical implementation issues, as well as adoption challenges, and have only been able to address limited aspects of the problem.

Blockchain in action

On a blockchain network, the trade asset can be digitized by using cryptotokens to denote custody or ownership of the bearer. By tokenizing the trade asset, its transfer between trade transaction participants on a blockchain network can be conducted in parallel with the movement of the physical asset, establishing a clear chain of asset provenance.

An asset token, representing a unit of the trade goods being transported, can be initialized when the items are ready to be shipped and transferred by the exporter to the freight forwarder after the container is loaded. The token is subsequently transferred by the freight forwarder to the carrier after the cargo is placed on the shipping vessel, to customs before customs clearance, to inspection agencies (which provide the inspection certificate) and so on until final delivery to the importer. The transfer of the token is finalized on the blockchain through network consensus and immutably stored on the blockchain network to provide a tamper-proof record of the delivery and shipping status of the in-transit shipment.

During transit, updates from the token holder (for example from the freight forwarder regarding a delay in loading the cargo or customs delays) can be posted on the blockchain network in real-time. Similarly, the transit route and duration of the shipping vessel, along with data on transport conditions captured by sensor-based monitoring devices, can be immutably captured through the blockchain network.

Trade-related documents can also be directly issued and verified on a blockchain network by relevant parties (see Figure 2, next page). For instance, after the custody transfer to the freight forwarder or carrier, the multimodal or maritime bill of lading can be automatically generated directly on the blockchain network by using the data attributes from the underlying trade contracts. This digital document can be instantly transferred to the importer or consignee on payment or acceptance — or even before that — depending on the contract terms. Whereas past attempts at electronic or paperless bill of lading have struggled to establish the difference between an original bill of lading and its electronic copies (with a common workaround currently being the use of a centralized registry to manage the ownership of title), a blockchain-based solution can resolve this issue through an underlying network consensus mechanism that ensures all participants can access a single final version of the document.

Finally, customs fees and payments to the supplier and the service providers, such as transporters, freight forwarders and inspection agencies, can be structured as smart contracts, which are automatically initiated after successful service completion is verified on the blockchain network.

Blockchain benefits

Delivery assurance to the buyer

Digitizing the trade asset using a blockchain approach provides delivery assurance to buyers by preventing delays in the release of cargo due to issues with title and other commercial documents. Doing so enables better risk management through enhanced visibility into the status and transport conditions of the shipment and reduces potential manipulation and errors in trade documents.

Asset tokenization enhances shipment status visibility

Asset tokenization on a blockchain network provides a transparent and immutable record of the shipment transit details, including arrival and departure from originating, transit and destination ports, delivery route, boarding and transport conditions, inspection and custom clearance status, reasons for delay and so on. This results in clear visibility into the current status of the goods and their movement across the

Verifying trade documentation via token passing

An in-transit shipment can be tokenized on a blockchain network to track custody or ownership of the bearer in real-time.

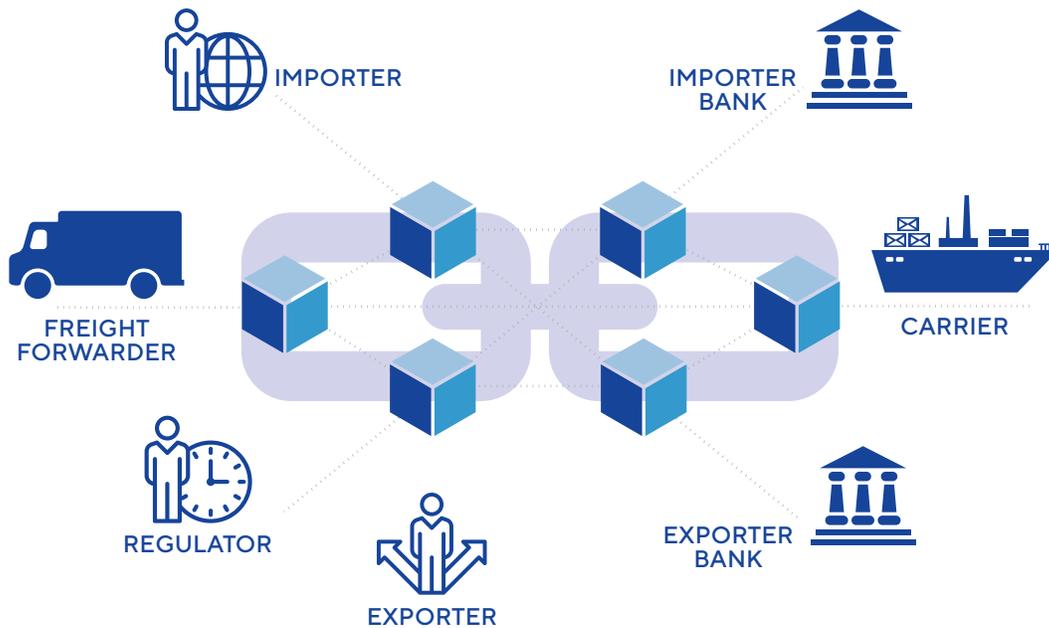


Figure 2

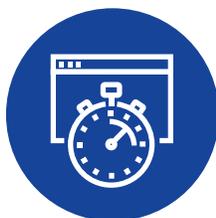
The benefits of a single version of truth

Trade asset tokenization on a blockchain network provides delivery assurance through improved oversight, preventing documentary errors and fraud.



ENHANCED VISIBILITY IN SHIPMENT STATUS

Asset tokenization establishes a clear chain of asset provenance on blockchain and enables real-time updates.



FASTER RELEASE OF SHIPMENT

The bill of lading can be directly issued and transferred on blockchain, eliminating delays.



REDUCED MANIPULATION AND ERROR IN TRADE DOCUMENT

Transaction traceability and data immutability prevent alterations and forgeries and ensure a single version of the document.

Figure 3

transport chain. The resulting reduction in trade transport opacity enables better risk management by providing all parties – including the importer, banks, insurers and regulators – with up-to-date and timely information regarding potential schedule delays and holdups. They can use this information to make timely adjustments for downstream commitments, improving transport efficiency and reducing bottlenecks.

Along with tracking geographic location, organizations can better assess service quality and merchandise damage of in-transit shipment, as well as verify contract compliance, through real-time updates on the blockchain network about transport conditions, whether manual or automatic, enabled by Internet of Things (IoT). For example, if the optimal temperature range for transporting perishable goods such as tulips is 40°F to 63°F, but the shipping temperature exceeds 70°F for long periods of time, this variance can be a critical input for determining the payment to the carrier and for making future shipping choices.



Document digitization speeds shipment release data

Blockchain networks reduce document-related inefficiencies by enabling the movement of assets in the real-world in parallel with the exchange of related documentation. This eliminates delays in claiming the goods due to non-receipt of title. Customs and inspection authorities onboarded on a blockchain network can directly verify the details of the shipment and issue the documents or provide approvals on auto-generated forms. Cost overruns and delays due to data re-entry, authentication of paper forms and errors such as missing signatures, etc. are reduced because documents can be dynamically created from digital templates based on immutable data attributes stored on a blockchain network. This ensures that all the documents remain in sync with one another and with the underlying trade contracts.

Information immutability reduces data manipulation and trade document errors

Transaction traceability and immutability of information on blockchain can substantially reduce documentary fraud in a number of ways.

- **Instead of multiple copies of originals issued for documents such as bill of lading**, only one digital instance is generated, which eliminates the possibility of forgeries for the importer.
- **Each party on the blockchain network, based on their permissions, can view the data** uploaded from other sources but can only add or modify information for which they are responsible.
- **No party can alter original data on its own without consensus** because all entries on the blockchain are clearly traceable to their source, and information in documents is pre-filled using the data immutably stored on blockchain. Transaction traceability also supports related processes, such as high-seas trading, through quick and easy transfer of documents among multiple parties.

Looking forward: electronic bill of lading on blockchain

Despite the clear advantages of blockchain-based electronic bill of lading applications, widespread adoption would require addressing several design and feasibility concerns, particularly those regarding legal acceptance and regulatory applicability of the digital solution.

The electronic bills of lading would need to mirror their paper counterparts to ensure that carriers supporting them are not denied liability (protection and indemnity) insurance. As of the end of 2017, the International Group of P&I Clubs supports three electronic trading systems: Bolero International Ltd., essDOCS Ltd. and E-Title Authority Pte Ltd.⁵ Each has its own user agreement, which participating trade parties are obliged to sign as a binding contract that defines their rights and obligations when using electronic titles (the Bolero Rulebook, essDOCS' Databridge Services & User Agreement, or DSUA, and E-Title's Electronic Title User Agreement).⁶

While both Bolero and essDOCS maintain central registries to manage the ownership of title and transfer e-title through novation and attornment, E-Title transfers electronic bills of lading through a peer-to-peer mechanism and uses hardware security modules⁷ as one way to avoid the problem of double trading. In November 2017, Bolero signed a memorandum of understanding⁸ with fintech consortium R3 to redesign its electronic bill of lading service using blockchain technology.

An effective blockchain solution for electronic negotiation of titles and other trade documents would need to be robust enough to encompass the fundamental properties and attributes of their paper equivalents, including guaranteeing negotiability and finality of transfer, enforceability of amendments and splits through inter-party agreements, and support for a switch to paper form while ensuring that only one of the paper or electronic version exists at one time. Further, such networks would need to be scalable, aligned with trade processes, interoperable with other electronic trading systems and pluggable into existing infrastructure of trade applications, corporate ERP systems and the carrier networks to ensure support for documents across networks and coverage of all aspects fundamental to financing of trade.

An effective blockchain solution for electronic negotiation of titles and other trade documents would need to be robust enough to encompass the fundamental properties and attributes of their paper equivalents.

Endnotes

- ¹ Read [Part I](#) here and [Part II](#) of this series here.
- ² Marek Dubovec, "The Problems and Possibilities for Using Electronic Bills of Lading as Collateral," Arizona Journal of International and Comparative Law, Vol. 23, No. 2, 2006, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2135246.
- ³ Mark Dixon and Bernard Glasson, "Electronic Payment Systems for International Trade," Curtin University, www.researchgate.net/publication/228755382_Electronic_Payment_Systems_for_International_Trade.
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- ⁵ Barry Stimpson, Jody Wood and Justine Barthe-Dejean, "Electronic Bills of Lading: Another Step Forward," Reed Smith, Jan. 11, 2016, www.reedsmith.com/en/perspectives/2016/01/electronic-bills-of-lading-another-step-forward.
- ⁶ "Electronic Title User Agreement," E-Title, www.e-title.net/etug_agreement.php.
- ⁷ "Sending an Electronic Title," E-Title, www.e-title.net/sol_work_send.php.
- ⁸ Sanne Wass, "Bolero's Electronic Bill of Lading Service to Get Blockchain Upgrade," Global Trade Review, Nov. 10, 2017, www.gtreview.com/news/fintech/boleros-electronic-bill-of-lading-service-to-get-blockchain-upgrade/.

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- Thomas Miller, "Electronic Bills of Lading," UK P&I Club, May 2017, www.ukpandi.com/fileadmin/uploads/uk-pi/Documents/2017/Legal_Briefing_e_bill_of_Lading_WEB.pdf.

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Lata Varghese is a Cognizant Assistant Vice-President who leads the company's cross-industry Blockchain and Distributed Ledger Practice. In this role, she oversees the practice's efforts in providing business and technology consulting and implementation services related to the blockchain and distributed ledger suite of transformative technologies. Lata's expertise resides in business consulting, go-to-market, alliances

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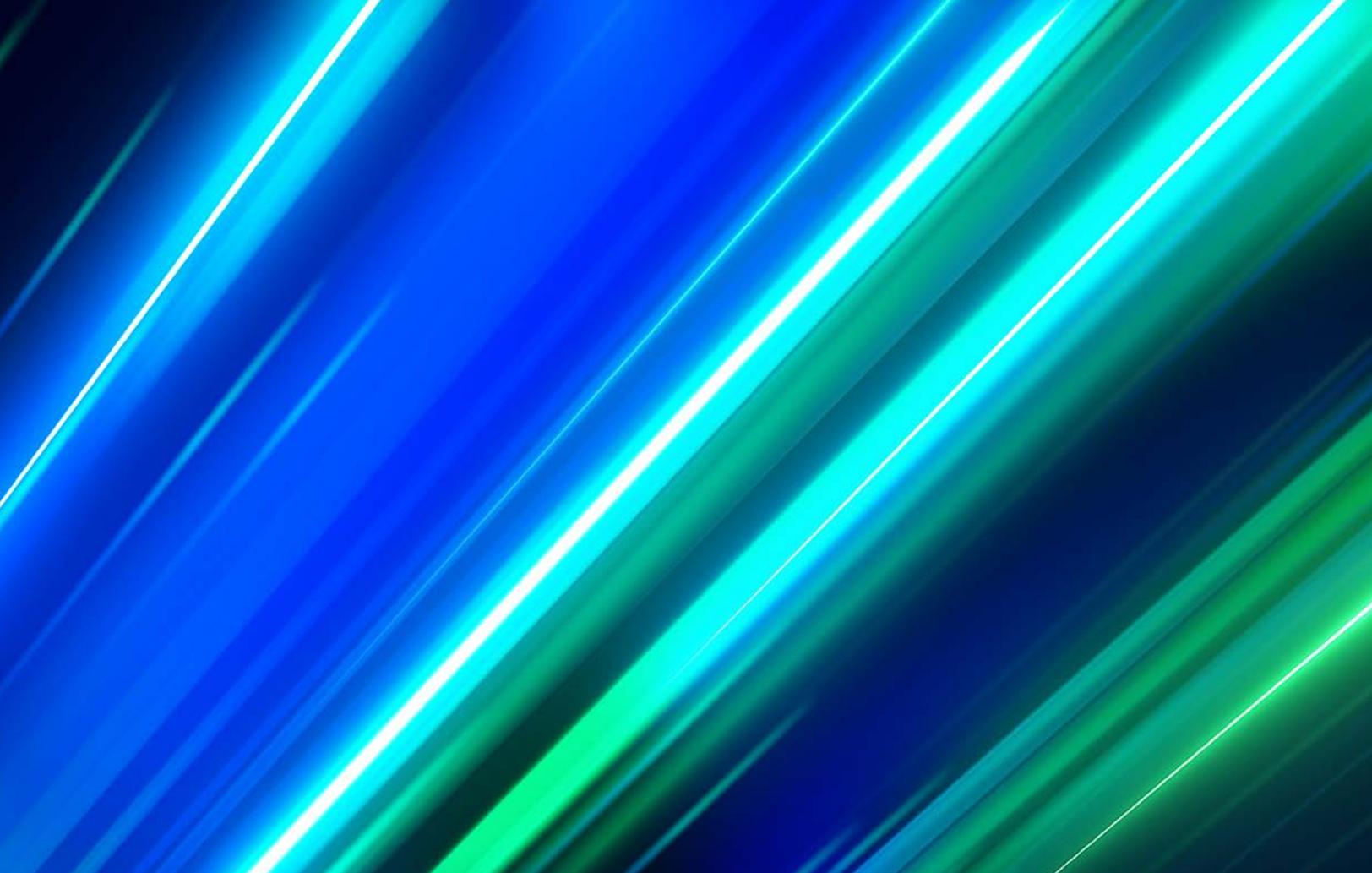


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Rashi Goyal is a Senior Manager with Cognizant's Blockchain and Distributed Ledger Consulting Practice. She currently leads Cognizant's wholesale banking (trade finance) blockchain initiatives and is the venture lead for a blockchain/DLT start-up within Cognizant around trade and SME financing. She has a strong conceptual understanding of blockchain design frameworks, consensus mechanisms and smart

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