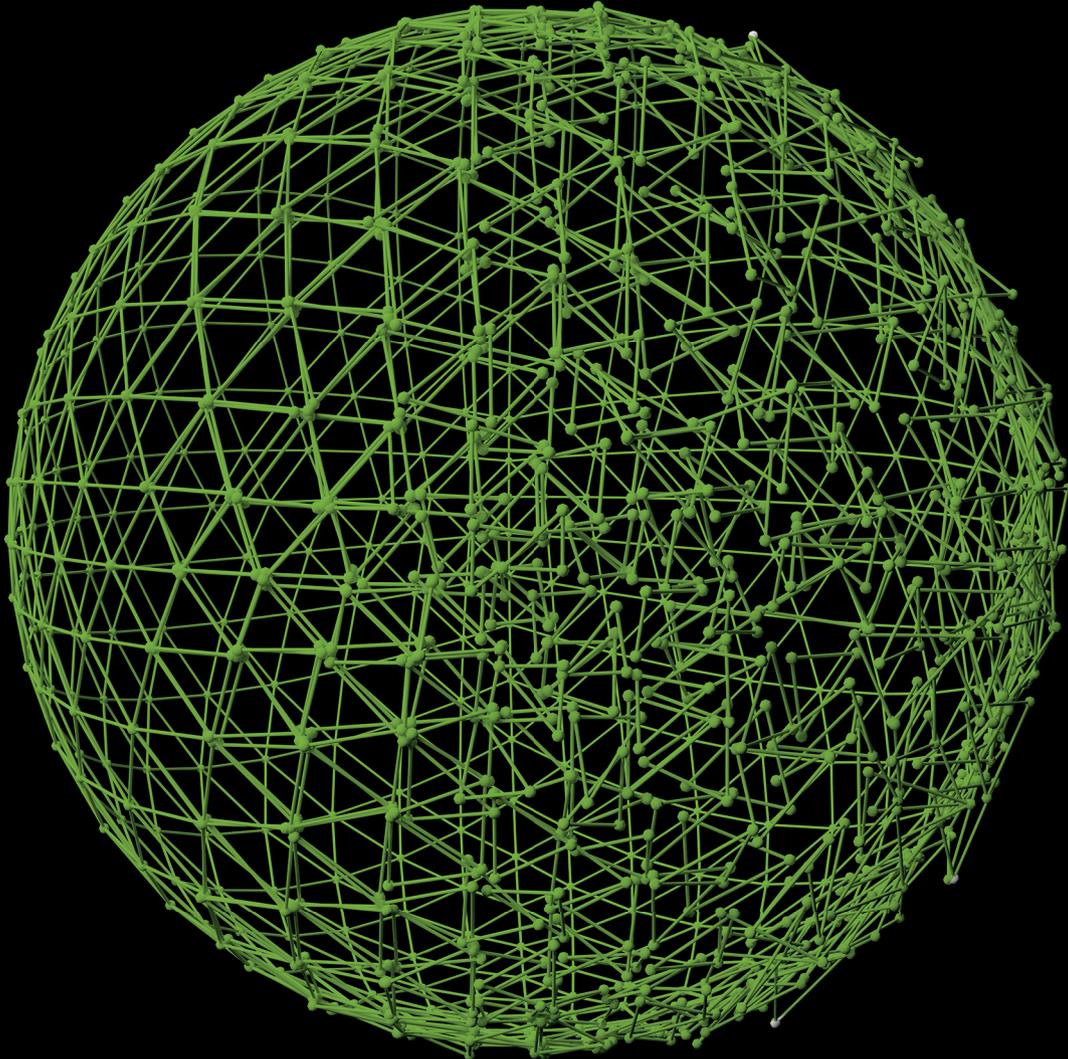


Deloitte.



Distributed ledger technologies services
Using the power of blockchain

What is blockchain?

Blockchain and Distributed Ledger Technologies (DLTs) are bringing disintermediation to nearly all industries, from the Financial Services Industry to other sectors like Healthcare, Energy, Telecommunications, and Supply Chain. In practice, blockchain technology offers a new way to share value and information—including money, asset property, or even identity—in a secure, transparent, and efficient way.

DLTs can be defined as digital and distributed transaction ledgers that stores blocks of data shared across a network of computer nodes. More specifically, blockchain technology consists in a decentralized ledger that operates in a transparent environment. Each block of the ledger contains data about transactions that have been executed on the platform. In order to add a block to the ledger, every computer node of the network needs to verify and validate it. Thanks to this verification, the system does not need an intermediary to check transactions. Information stored in a blockchain can never be deleted and serves as a verifiable and accurate ledger of every transaction made within the system.

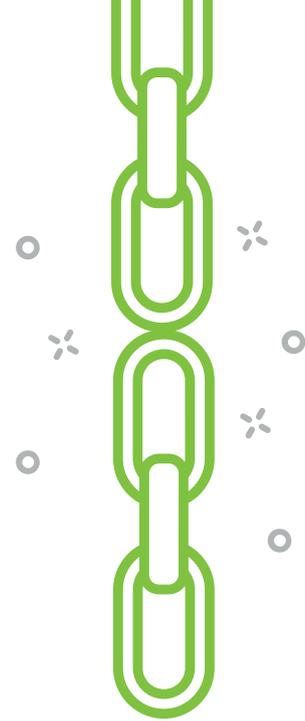
Distributed Ledger Technologies offer several characteristics:

- **Reliable and available:** The large number of participants (called nodes) that need to reach consensus to validate transactions ensure the reliability of the information. Also DLTs do not have a single point of failure and are better suited to withstand malicious attacks.
- **Transparent and immutable:** Any movement in the distributed ledger is visible to all authorized participants,

which increases auditability and trust. This also facilitates fraud detection and traceability as it is impossible to alter information within the blockchain without detection.

- **Digital:** Any document, asset, or data can be expressed in code and tracked digitally on a DLT.
- **Secure:** Cryptography ensures safety and pseudo-anonymity of the information stored on the blockchain.

DLTs can be defined as digital and distributed transaction ledgers that stores blocks of data shared across a network



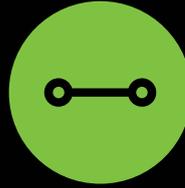
Benefits and challenges

Blockchain and other DLTs bring major benefits, such as:



Integrity

Transactions will be executed exactly as programmed, without the possibility to alter this process, so integrity is preserved. The blockchain is reliable, because the ledger is immutable, irrevocable, and there is no single point of failure.



Disintermediation

It allows two parties to operate without the oversight or intermediation of a third party, strongly increasing speed of transaction processing, reducing or even eliminating counterparty risk, and making possible new business models.



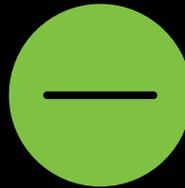
Traceability

Verifying and tracking information would be easier with blockchain-timestamped information. The blockchain would enable a more secure audit trail, as it provides a common source of information, allowing users to instantaneously share encrypted data.



Ecosystem simplification

With all transactions being added to a single public ledger, it reduces the clutter and complications of multiple ledgers.



Lower transaction costs

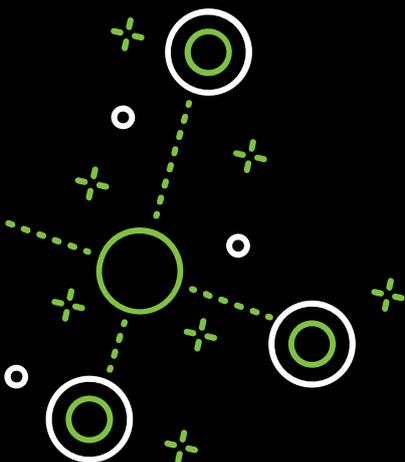
By eliminating third party intermediaries and increasing automation, DLTs have the potential to greatly reduce transaction fees and overall processing costs.



Empowered users

Users are in control of their information and transactions.

Blockchain can help in many domains, but the technology must still improve in some areas:



- **Nascent technology:** Resolving challenges such as transaction speed, the verification process, and data limits will be crucial in making blockchain widely applicable.
- **Uncertain regulatory status:** Distributed ledger technologies and cryptocurrencies face a large hurdle in widespread adoption by pre-existing financial institutions and potential users if government regulation status remains unsettled. Questions have to be resolved by regulators especially as regards their use as asset or money, the conditions for initial coin offerings, their leveraging for transaction processing platforms especially when they can desintermediate regulated third party intermediaries, the enforcement of smart contracts in court, etc.
- **The link between physical and digital:** Some assets or transactions, such as books, music, and money transfers, are already digital or easy to digitalize. For others, such as physical arts or parcels, the link between physical assets and their digital representations - often called "tokens" - can only be made through integration with additional technologies such IoT with RFID chips.
- **Large energy consumption:** The Bitcoin blockchain network's miners are attempting 450 thousand trillion solutions per second in efforts to validate transactions, using substantial amounts of computer power.
- **Data protection:** With the new European regulation on data privacy (GDPR), Blockchain will have to implement the right to be forgotten, as all the transactions are recorded in the blockchain and cannot be deleted. A possible solution can be to anonymize the information sent to the blockchain.
- **Cultural adoption:** Blockchain represents a complete shift to a decentralized network which requires the buy-in of its users and operators.
- **Integration concerns:** DLT application offer solutions that require significant changes to, or complete replacement of, existing systems and business processes. In order to make the switch, companies must strategize the transition.

Distributed Ledger Technologies are attracting public interest with many articles and events. In the coming years, this technology will be in the center of our day-to-day life. In order to not miss the train of innovation, everyone needs to be ready for the change and understand this technology.

How Deloitte can help

Deloitte Luxembourg is one of the blockchain pioneers in the country. We created the internal initiative in early 2015 and built our competences around technical and functional topics. Thanks to our blockchain knowledge and our subject matter expertise, we provide you a range of services: knowledge-building, broad network access, prototyping, and implementation.

- **Strategy and operating model design:**

- We organize and participate in workshops to present the concept and discuss potential impacts on your industry or business
- We assist you in defining your strategy, business and operating models by analyzing market forces and internal potential
- We are able to design use-cases to better understand a concept, learn lessons, and confirm the extent to which distributed ledger technology is better suited than traditional ways of working.

- **Technologies selection:**

- We have industry experience with blockchain technologies such as Ethereum and the Hyperledger project
- We will select and use the most appropriate platform to help bring your vision from paper to end product

- We have a strong experience working with smart contracts and the automation of several processes within a distributed workflow

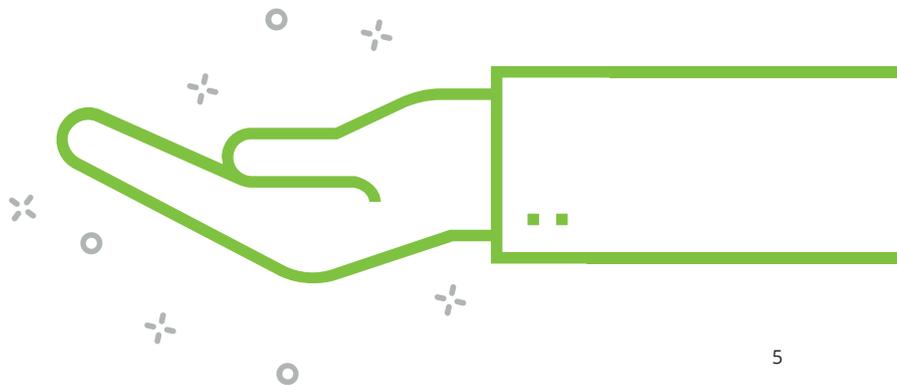
- **Use cases /POC development:**

- We bring a proven process and capability for solid experimentation and rapid, iterative prototyping with demos
- Our cross-functional agile teams develop proofs-of-concept (PoCs)

and mature them into fully-developed solutions, using our portfolio of prebuilt assets and development kits

- **Implementation**

- Thanks to our expertise in both IT systems and DLT, we can help your business to overcome the challenges of implementation and the integration of Blockchain with your information system



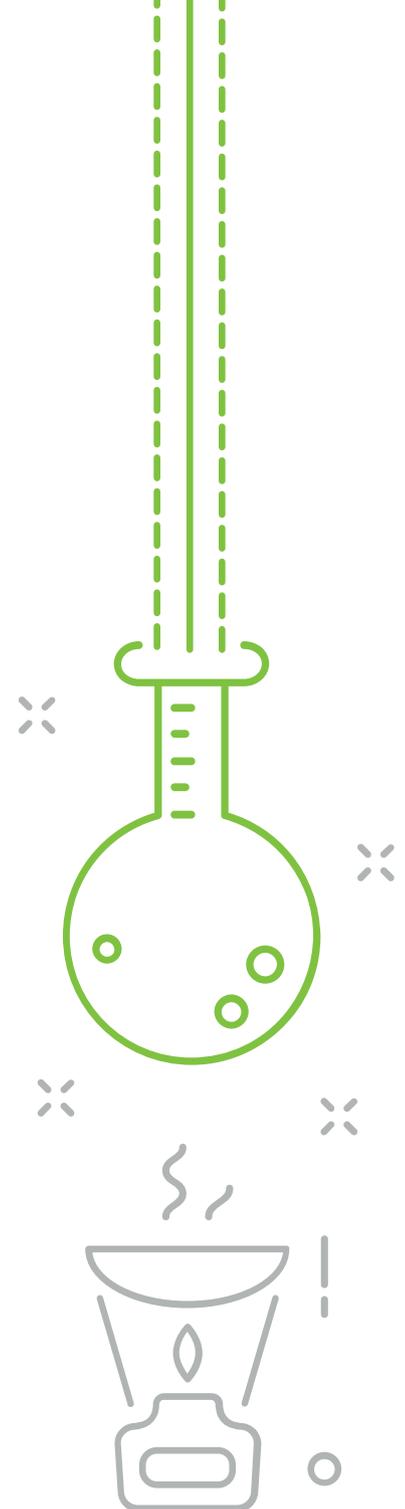
The Deloitte Luxembourg Innovation Lab

Our motto is: “We don’t just talk about innovation, we accelerate it”. We are focused on three main activities: generating knowledge, developing PoCs, and exploring new technologies.

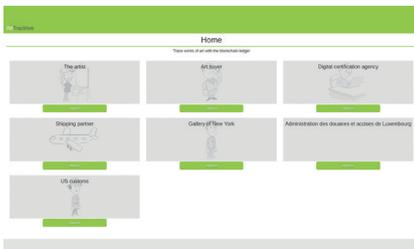
Our team is composed of CX/UX designers, technology engineers and subject matter experts in various industries. We also collaborate closely with the EMEA blockchain community and other centers of excellence in digital, analytics, and information management to create a new way of thinking.

Our team of experts will work with you in order to identify which use case fits your needs and to develop your blockchain capabilities.

Our innovation lab into which we integrate industry experts allows for fast and iterative application of new technologies as well as thorough exploration of how they impact your business and operating models.

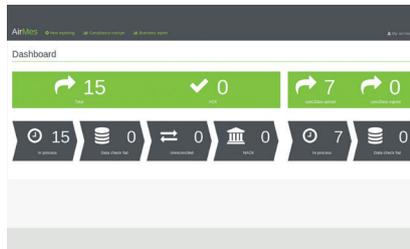


A few PoCs recently developed in our lab



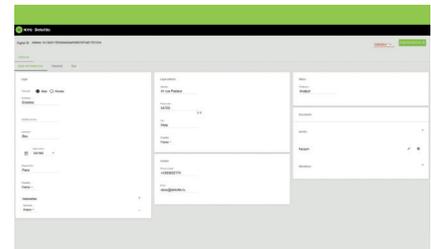
ArtTracktive

ArtTracktive is a platform developed to solve traceability issues in art by recording interactions between all parties on a blockchain. Parties interact with the blockchain through a web application in order to record their actions: from the introduction of the piece of art, certification, lease or sale, shipping, and customs clearing.



AirMes

In the context of EMIR, MiFIR, and SFTR regulations, Deloitte developed a blockchain platform that supports financial institutions in doing their regulatory transaction reporting. The platform improves the quality and transparency of the reported transaction data.



MyD.ID

In order to improve the customer on-boarding process, we applied blockchain technology to support the KYC procedure through the usage of digital identity. Thanks to blockchain, users receive a token representing their identity after completing a traditional KYC check, which may be reused when other KYC checks are required.

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