

BLOCKCHAIN

Unchaining business through the Blockchain.

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A FEW WORDS

Most of today's enabling technologies have witnessed their fair share of hype and a certain "coming of age". All have had high expectations placed upon them and, for the most part, mature ways of exploiting them are being found. This is what defines the current age of Digital Transformation. Blockchain technology carries the weight of huge expectations both in terms of applicability and in terms of revenue growth (not forgetting cost efficiency) more than any of the others. But unlike the other technologies, it has yet to witness maturity in its utilization and applicability.

Like many frontier technologies that came before, Blockchain technology is not only struggling to find its way, but it has also generated a lot of differing points of views and definitions.

It is understandable that non-mature technologies generate hype and confusion. Despite the great interest of different sectors to integrate new technologies into business processes, there is still a lack of answers to central questions regarding the meaningful and effective use of these in practice.

New technologies raise expectations that rapidly turn into hype as widespread experimentation explodes. Unrealistic demands for up-and-coming (and often untested) technologies lead to unfulfillment and disillusionment. This, in turn, results in a decrease in experimentation. It also marks the period during which hype begins to decelerate and the foundations of a mature solution can be laid.

This is the moment we are currently witnessing when it comes to Blockchain. Blockchain is finally moving past its hype phase. Widespread experimentation is thinning out and becoming more focused, which will prove central to its reaching maturity.



BLOCKCHAIN

Currently, as this paper will confirm, most Blockchain applications are still stuck at an experimental level. This is true across a number of different industries. At the same time, new ideas for Blockchain technologies and their applications are developing rapidly. Within the broad Blockchain community, the debate on the possible directions that this field can take and their potential impact on society, industry, commerce and government continues.

The promise that lies within Blockchain is that of immutability, reliability, complete transparency, security of transactions, all within a decentralized ecosystem. A means of ensuring data security and integrity for all participants at all times. This idea sells, because in a world that is increasingly relying on data and real-time decision-making capabilities to operate, ensuring the security and integrity of data is fundamental.

The debate is open as to whether this technology will truly be revolutionary, or if instead its impact will be limited. We are currently exploring the frontiers of this technology as well, creating new conversations, enabling explorative workshops, funding research projects and providing the technology and resources needed to co-design effective Blockchain business solutions together with our clients.

We believe that several interesting business applications leveraging Blockchain are on the horizon that could contribute significantly to the world's ongoing improvement.

In the next few pages, you will read about how we define this technology and how we work with our clients and partners to apply it. You will explore real-life use cases and you will learn how we believe Blockchain will evolve in the future.



BLOCKCHAIN

1

WHAT IS BLOCKCHAIN?

BLOCKCHAIN

There are many different definitions for the term “Blockchain.” Some are derived from genuinely different points of view, others are just aimed at cashing in on the hype, thus generating confusion. We have been researching and developing this concept since 2014, and this has enabled us to create our own vision and our own definition for this technology.

So, what is Blockchain? From a technical point of view, Blockchain is a distributed, decentralized, public or private ledger of cryptographically signed, irrevocable blocks of transactions, shared by all participants within a certain ecosystem.

The reason for the interest in Blockchain lies in its basic attributes that provide security, data integrity and immutability, a certain type of anonymity without any third party in control of the transactions involving data and information. This creates interesting research fields, ones encouraging the exploration not only of business applications of this new paradigm, but also of new technological frontiers.

Blockchain is a distributed database solution that maintains a continuously growing list of data records resistant to changes and revisions, even if they have been done by the same nodes in which the data resides and are confirmed by the other nodes participating in the network.

A copy of the list of records is stored on all the nodes of the network, and it is always maintained safe, even in the presence of unreliable participants. The records stored in such a database can be one of two types: the transactions, i.e. the actual data, and the blocks, which are registers of the order in which the transactions were indelibly inserted into the database.



Within these few lines and concepts lies a universe of great business opportunities. For the first time in human history, different business players, acting within a multifaceted ecosystem, are able to share information, values, content and responsibilities, while delegating highly complex aspects, such as trust, consensus and immutability, directly to the technology.

Such features can be found in different architectures too, similar in nature but ones we would not consider to be Blockchain. We call them Distributed Ledger Technologies (DLT), and they can certainly be used successfully across a number of different business applications.



Blockchain is just one type of DLT. Unlike Blockchain, a distributed ledger does not necessarily have to have a sequence of blocks. In fact, Blockchain represents just a subset of a type of distributed ledger. From an initial approach, the distributed ledger is defined in the same concept as Blockchain. However, all Blockchains are distributed ledgers, but not all distributed ledgers are Blockchains.

To clarify this subtle but important distinction, we rely on one of the most authoritative documents (still being drafted) on the matter, issued by the International Organization for Standardization – ISO/CD 23257.2 – which states that “a Blockchain platform is a DLT platform in which the technology used is Blockchain.”

BLOCKCHAIN

DLT and Blockchain share some baseline features: they are both distributed ledgers with asymmetric key cryptography, with a consensus protocol for transaction validation, and based on a P2P network for data propagation.

Blockchain e Distributed Ledger Technologies (DLT)

	Blockchain	DLT
Definition	Belongs to the category of DLT in which every single node holds a copy of the ledger. Every time someone adds a new transaction, a new copy of the ledger is created.	DLT is a database decentralized across several computers or nodes. Every node maintains the ledger, and each node is authorized to update the distributed ledgers independently from the others but under the consensual control of the other nodes.
Structure	Data and information represent a chain of blocks. This structure is not the real structure of distributed ledgers.	It is a database distributed across several nodes. Data is represented differently for different ledgers.
Sequence of Block	You can find all the blocks in a particular sequence.	You do not need to follow the Blockchain sequence of data.
Consensus	Wide usage of proof-of-work mechanisms in Blockchain.	No particular kind of consensus is needed, thus more scalable than Blockchain.
Implementation in real case	Many enterprises and startups are already using Blockchain.	DLT projects and usage are still under development. Few real-world implementations exist.
Tokens	Many Blockchain platforms involve some sort of token economy.	No tokens or any other kind of currency are needed on the network.

This Blockchain-enabled scenario can be easily understood if we think about the most famous Blockchain application: Bitcoin, the first and most important cryptocurrency in the world. Bitcoin is a digital asset that can be shared between different players using Blockchain, the native technical infrastructure of Bitcoin, trusted to ensure the accuracy of transactions, prevent instances of double spending and guarantee the immutability of the information stored on the chain.

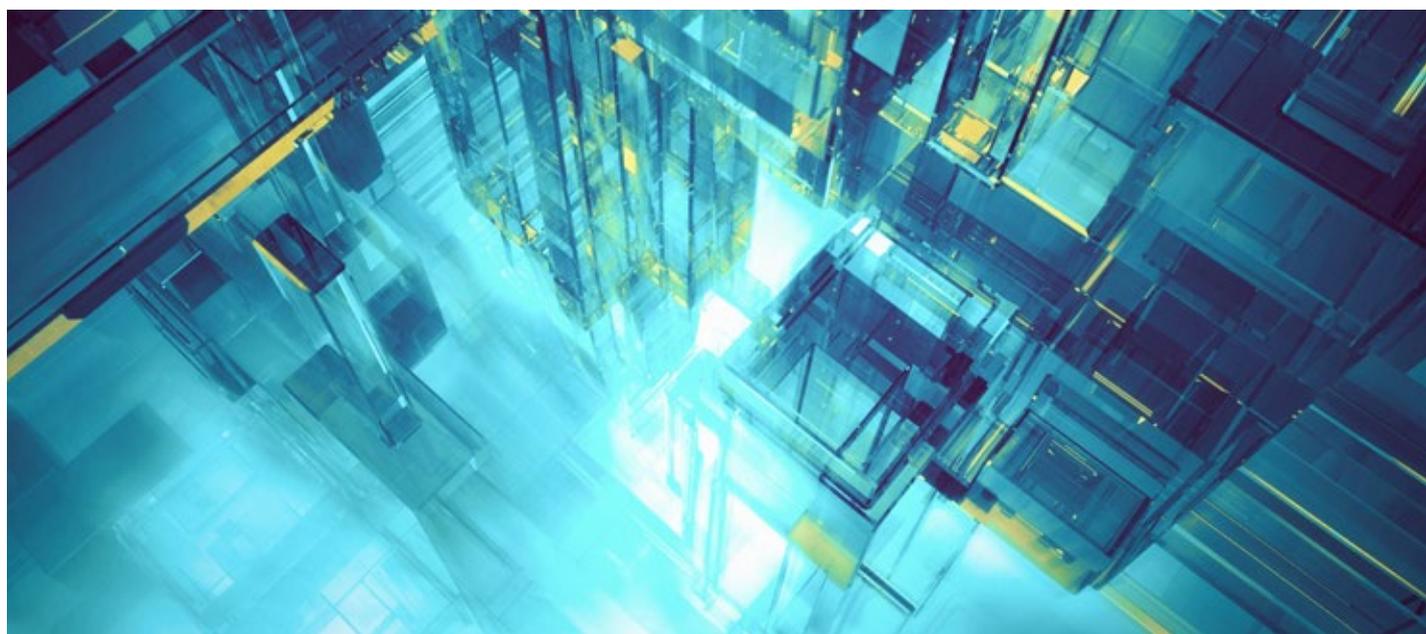
Starting from the first version of Bitcoin's peer-to-peer system, the Blockchain concept continued to grow and evolve as a multi-purpose technology, enabling use cases that went far beyond the functionalities of cryptocurrencies.

Thanks to the impact of this very first application, today we have several different blockchain technologies with various technical properties and different functions for users that we can use to design and realize applications for new business use cases.

DLT and Blockchain technologies enable transactions ensuring complete transparency, since they are available to everyone. They also ensure complete security, as these blocks cannot be altered and this, of course, guarantees data integrity over time. In the long run, this concept could revolutionize the way we interact and do business across new digital platform ecosystems, because it can guarantee complete, transparent and safe information exchange.

Architettura DLT

Property	Public	Private	Consortium
Consensus	All the miners	Centralized organization	A set of nodes
Permission	Public	Public or restricted	Public or restricted
Immutability	Nearly impossible	Could be tampered with	Could be tempered with
Efficiency	Low	High	High
Consensus Process	Permission-less	Permissioned	Permissioned



BLOCKCHAIN

Public, Private or Consortium DLT: Current DLT architecture systems can be categorized into three types: Public, Private or Consortium. "Public" DLT are systems in which anyone can access the network. They are zero-trust systems in which nodes are pseudo-anonymous and rule compliance is enforced by incentives and by a competitive process, such as a math puzzle-solving scheme (known as proof-of-work). In "Private" DLT, access is allowed only with specific authorization; these systems are based on trusted parties and strong digital identities, so rule compliance is imposed by a number of cooperating authorities and accepted by all the participants in the network. Consortium DLT is governed by a restricted group of nodes and not by a single central node. This structure ensures decentralization, an element that characterizes Blockchain, making all nodes independent from each other, but subject to mutual control.

Permission-less or Permissioned DLT: "Permission-less" DLT are systems in which anyone can operate, without authentication and without permits of any kind. Conversely, you can only operate on "Permissioned" DLT if you are authorized.

Distributed ledger technologies can be classified using several analysis dimensions:

- Who can access the distributed ledger?
- What kind of permissions are needed to operate on the distributed ledger?
- What kind of cryptography is used?
- What kind of consensus is used?
- What is the shape of the network (centralized, distributed or decentralized)?
- Who can decide the priority in block closing?
- Who pays for infrastructure and computation costs?
- Which algorithms are used and what kind of behavior do they have?

By combining the first two dimensions we will obtain:

1

Public & Permission-less DLT: Everyone can access these systems, read and write information, without the need for permission to perform operations, including participation in the consensus mechanism and verification of transactions. Examples of these systems are Bitcoin and Ethereum. According to some experts, these systems are the only ones that can truly be called "Blockchain," as they have the four characteristics that are universally recognized in these architectures: security, transparency, decentralization and immutability.

2

Public & Permissioned DLT: Everyone can access these systems and read information stored in the blocks, but permits and authorizations are needed to perform other operations, such as adding a new transaction to the system. An example of a use case for this type of system is the tracking of the food chain: a consumer can independently read and verify the origin and the path taken by a food product, but only qualified users, such as operators in the supply chain, can enter new information in the system (e.g. changing the status of a batch).mpio, un cambio di stato in un lotto di merci).

3

Private & Permission-less DLT: Operations are limited to certain groups of users in these systems, but no special permissions are required to perform these operations. The limitation typically occurs by “geographically” isolating the network, so as not to provide public access, but to limit it within an organization.

4

Private & Permissioned DLT: These are systems in which access is limited to specific groups of users, and special permits and requirements are also required to perform operations in the system. An example of this type of DLT is the Hyperledger Fabric platform.

Sometimes, using public and permission-less Blockchain is convenient, especially when the ecosystem is open and the infrastructure has to be used by non-predictable users. On the other side, under certain conditions, using a private and permissioned distributed ledger can also be convenient, especially when the need is to share value and information between previously defined users in a closed ecosystem. In both cases, the ecosystems can take advantage of Blockchain or DLT infrastructure for their intended purposes, delegating to them complete assurance of every aspect of trust and immutability. This opens up a world of new opportunities for both the business and industrial fields.

At Engineering, we are not only studying how DLT and Blockchain technologies are evolving, but we are actively contributing to their advancement. We are participating in the most important international working groups on DLT and Blockchain, including the “Focus Group on Application of Distributed Ledger Technology” at the United Nation level and the ISO/TC 307 “Blockchain and Distributed ledger technologies” at the global level, focused on designing and developing the best Blockchain strategies at every level.

2

HOW DOES IT WORK?



BLOCKCHAIN

Blockchain is, as the name implies, a chain of information blocks. Each block is an approved unit of storage (more on this later) containing a sequence of transactions, which in turn are individual records carrying some information payload. Each block has a timestamp and a reference link to the previous block that must be confirmed and encrypted; this ensures **immutability** and **full traceability** of the chain.

Thanks to its underlying characteristics of immutability, transparency, verifiability, data encryption and operational resilience, Blockchain can manage continuous improvement in cyber defense techniques, preventing fraudulent activity through consensus mechanisms and detecting data tampering. Of course, no cyber defense system can be considered 100% secure.

When a new block is created, it is linked to the last block in the chain, so that the resulting sequence represents the historical ledger of all transactions completed in the system from day zero.

In most systems, each block has limited capacity. For instance, for Bitcoin Blockchain, a new block is added about every 10 minutes, transactions are aggregated in blocks and they must be verified by the miners.

Blockchain information is not stored in any single location; each participant holds a full copy that is automatically kept in sync with all the others, in such a way that the information is **always accessible and not corruptible**.





Blockchain technology was created to reach a consensus on actions conducted in data storage systems, thus ensuring consistency that contributes to verification, atomicity, durability and information integrity. In contrast with traditional data storage systems, Blockchains provide different choices as ways to reach consensus. The “chain” metaphor is used to stress the concept that the ledger is immutable; once a block is written, it cannot be modified or deleted. To enforce this integrity constraint, Blockchain platforms use two techniques: A) cryptographic algorithms to seal content and B) the replication of the entire ledger by all the members of the distributed system. The latter allows the chain of blocks to be stored multiple times, by multiple users, increasing the reliability and the integrity of the chain. So, since each block contains information which refers to those belonging to the previous block of the chain, in order to modify a single block, it is necessary to modify all the blocks following the one being modified. More than this, it is necessary to do so for every participant in the chain, since all of them have a complete copy of the information, automatically synchronized with all the other copies.

In theory, from a technical point of view, it is possible to modify information stored on a Blockchain. However, in practice, this is basically impossible on most public Blockchains (e.g. those that host cryptocurrencies) for two main reasons:

- **Consensus:** each node of the network can independently detect any breach of the digital seals;
- **Computing Power:** the resources needed to change all nodes and blocks in all the Blockchains involved would be close to an unreachable amount.

For these reasons, we deem that information stored on a Blockchain is always accessible but not corruptible.

In order to truly mark a strong difference with more traditional architectures, the nodes of a Blockchain network must be owned and operated by different and autonomous entities that, while cooperating as peers on a common set of goals, are bound by a conflict of interest instead of good will and/or a hierarchy. In other words, all stakeholders do agree on some common rules, but at the same time, each one is vigilant against violations, because any such violation would benefit the perpetrator at the expense of the others.

This fundamental trait of Blockchain technology hardly makes the front page, which tends to focus on other and more obvious peculiarities such as information-sharing, immutability and resilience, but this could and should be an area to explore in order to develop more mature use cases.

As a system-of-record spanning multiple organizations, Blockchain is just the most basic application of a groundbreaking paradigm. In more advanced scenarios, the different nodes of a Blockchain network not only collaborate in securing the distributed ledger, but also apply validation rules to individual transactions, rejecting the containing block if it's not compliant. This process is just as tamper-proof as the ledger itself, because the final decision on its validity is reached by consensus; all nodes have their say and majority wins, so that malfunctioning or malicious nodes cannot corrupt the process. When the set of rules set is written into software, we call it a smart contract. With smart contracts, Blockchain technology can indeed enable a new era of safe but decentralized interaction, the like of which has never been seen before.

Also, by combining its immutability to the application of a specific timestamp (date and time) on each block of the chain, Blockchain technology ensures that a record exists from the instant the timestamp is applied to the block to which the information belongs.

What kind of assets do we want to notarize on a DLT system?

Blockchain would assume the role of a “data notary” and guard the accuracy of the data, acting as a digital seal.

Digital assets: A digital document or a set of data can be safely encrypted, and the resulting HASH can be easily published on a DLT system. In this way, their existence at the date of publication and their immutability is ensured over time.

Unique physical assets, reproduced by unique digital representations: An example is a high-definition photograph of a work of art, which can therefore be considered its unique digital representation. In this case, it is possible to notarize the digital representation, which brings us back to the previous case of the notarization of a digital asset.

3

WHAT DOES IT DO?



Trust & Accountability

One of the most important aspects in business relationships and partnerships is the concept of trust between all the different players within a global ecosystem. Trust management is a cost and represents a cultural hurdle for building positive business relationships. In business-related digital ecosystems, organizations struggle to define the balance between technology, processes and people. They need to make decisions and take steps to address this issue, if they are to improve and strengthen these levels of trust in the future. Ensuring trustworthy interactions between parties, data integrity, system uptime reliability and data accessibility could prove to be crucial for the success of any business ecosystem.

Digital trends are changing stakeholders' expectations and the use of technology is fundamentally affecting how organizations are being evaluated. Between organizations, there is a mutual lack of trust between stakeholders. Organizations are expected to act in a trustworthy manner, but even when they meet this requirement, their stakeholders do not always reciprocate by bestowing trust. Each stakeholder within a given domain must regularly report integrity of data and system uptime when carrying out operations, to guarantee and maintain the effectiveness of this management process.

With Blockchain, there is no need for a third party to certify the accountability of stakeholders, because all the stakeholders belonging to the same ecosystem can operate and at the same time verify the work performed by others. Any violation can be detected by the other participants of the network, who can then decide to reject the work of unreliable or malicious stakeholders. This is possible, because all operations take place in a transparent way and are visible to all, following a consensus algorithm or common rules which were previously established and agreed upon. In this scenario, the concept of trust is intrinsic, so there is no need for any validation from a third party.



High Availability & Resilience

Consensus on the accuracy and immutability of data guarantees the resilience of the system, which is designed to withstand any type of attack in various environments. Well-established computer technologies that have been around for decades, such as cryptography and HASH algorithms, are included in Blockchain technology, ensuring network immunity to attacks of any kind, including data corruption and tampering.

This high resilience naturally determines the high availability of the data on Blockchain and DLT-based systems. Any tampering attempt is inhibited by design and corrupted data is restored thanks to the redundancy of the network. This ensures the integrity of the data and the continuity of the processes based upon it.

Single Point of Truth

DTL and Blockchain technologies create a distributed database in which data is kept in a redundant way through the nodes that participate in the network. This multitude of synchronized nodes constitutes a “Single Point of Truth,” because it makes it possible to preserve the integrity of the data while enabling any legitimate update coming from a node to be automatically received by the other participants in the network at the same time.

Determining a Single Point of Truth is one of the core drivers of data consistency in companies, and doing it through DLT or Blockchain can facilitate its realization.

What does it do?



Trust & Accountability

by ensuring mutual accountability between stakeholders



High Availability & Resilience

by ensuring integrity and continuity to critical processes, even in hostile environments



Single Point of Truth

by maintaining multiple and synchronized instance of the same process

4

WHY DO WE NEED IT?



BLOCKCHAIN

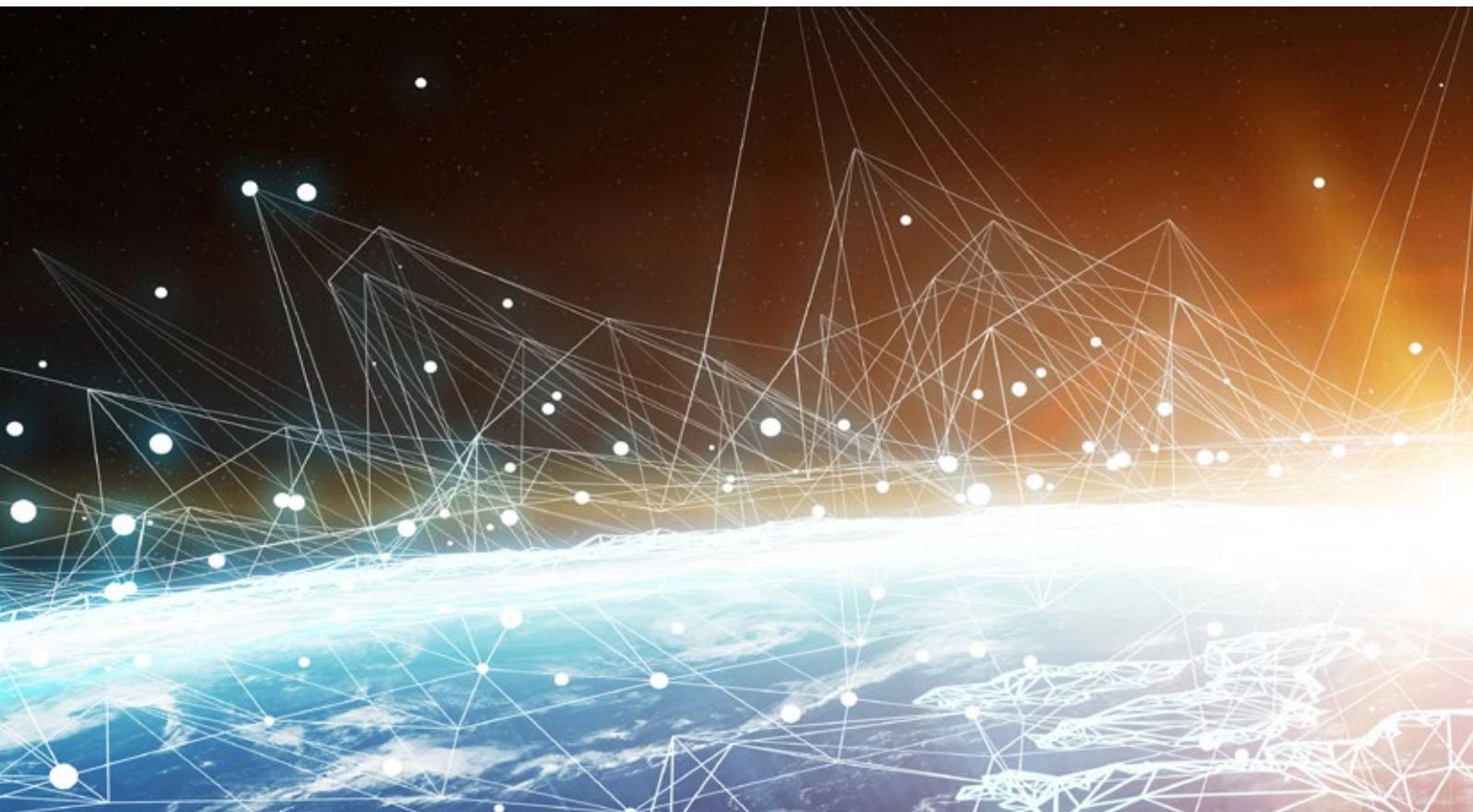
Blockchain ensures **complete transparency**, as it is accessible and available to everyone.

It also ensures **complete security**, as blocks cannot be altered and this, of course, guarantees data integrity.

Blockchain has the power to revolutionize the way we interact and do business across new digital ecosystems by guaranteeing the **complete, transparent and secure** transaction of information.

The main features of Blockchain technology, such as real-time transaction, timestamping, proof of ownership and resistance to failure, offer many opportunities for business process improvement, especially if they are applied within an infrastructure that can provide decentralized control over business rules. If necessary, an additional platform for the development of applications or smart contracts could be provided, which would run without any chance of downtime or censorship.

Blockchain technology, intended as a public register used in cryptocurrencies, enables transactions ensuring **transparency**, as it is available to everyone. For enterprise use cases, the level of transparency of the register depends on the choice of Blockchain or DLT, the difference between which was explained in first chapter of this paper.



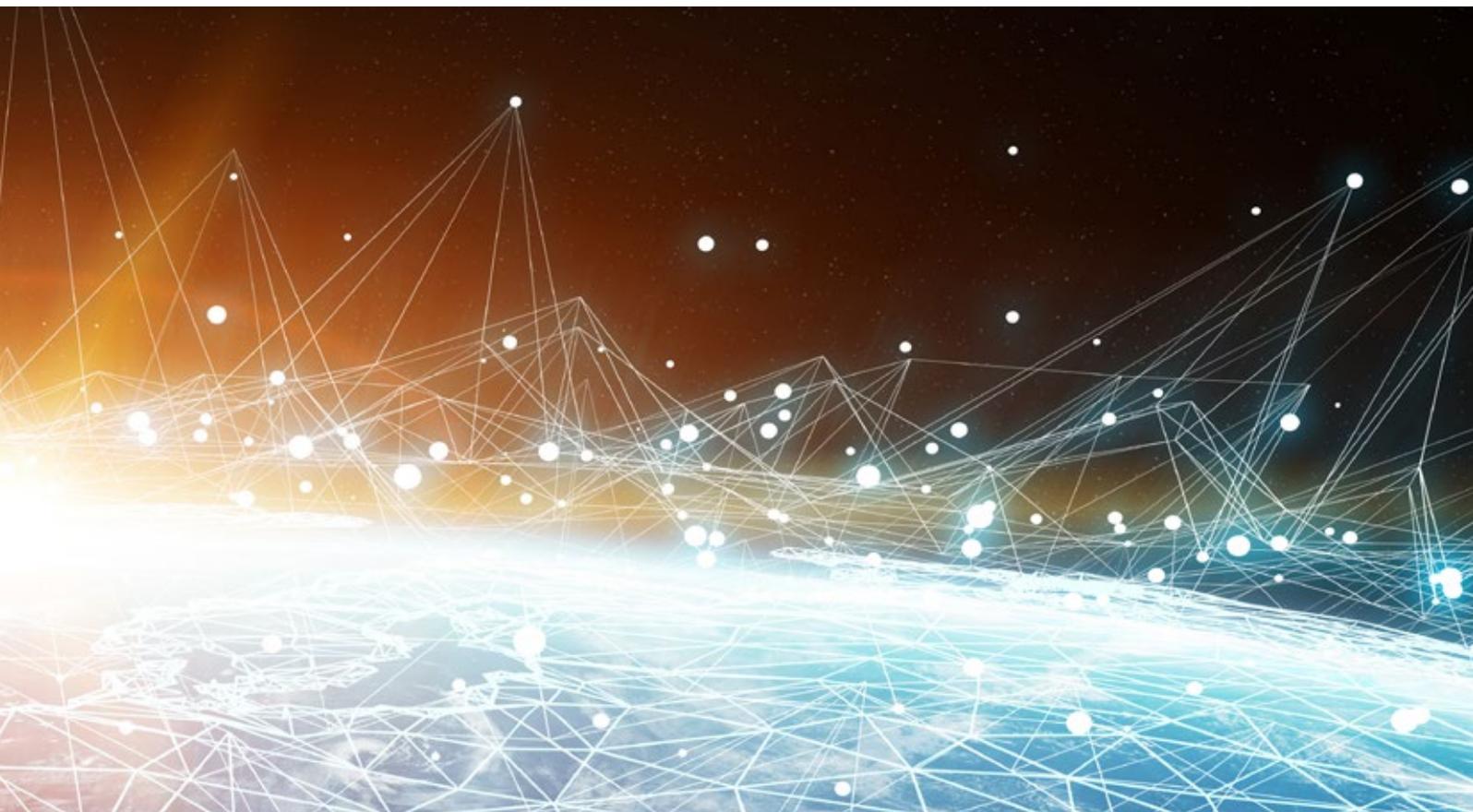
Blockchain also ensures complete security, as blocks cannot be altered and this, of course, guarantees the complete integrity of the data.

This system, characterized by its resilience, could be very beneficial for the storage of information or fulfillment of business processes. Blockchain's high level of security, which stems from the set of hacker-proof technologies on which it was originally built, protects transactions and data from any tampering threats and attempt, making them immutable to a fault.

The redundancy of the system, based on replicated copies of each node of the network, protects company data from ever being lost and ensures high availability. This is further strengthened by the distribution and decentralization of Blockchain nodes.

With Blockchain, there is no need to compromise. You do not have to choose between disintermediation and the need for trust, because both are guaranteed by the built-in mechanisms and intrinsic nature of the technology itself.

Simply stated, Blockchain has the power to revolutionize the way we interact and do business across new digital ecosystems by guaranteeing the complete, transparent and secure transaction of information.



5

**WHERE DO WE
APPLY IT?**



BLOCKCHAIN

In this section, we present a series of cross-industry, cross-BU snapshots of real-world Blockchain use cases we at Engineering have developed together with our partners and clients. Many more ahead!

THE WORLD WE LIVE IN

Smart Energy & Utilities

Enegan

Business Challenge

Enegan, one of the largest electricity and gas supply companies in Italy, was looking for a solution to optimize the use and exchange of energy, building the foundations for a future key role in the "distributed generation" of energy.

Solution

The solution is called "Energy Bank", a system of Blockchain transactions that allows private users of the energy network to optimize the production, accumulation, use and exchange of energy from renewable sources. Leveraging Blockchain technology the solution improves the amount of exchanged flows and information reliability.

PlatOne

Business Challenge

Energy transition requires innovative tools: the increasing adoption of renewable energy, characterized by an unforeseeable energy generation and in combination with less predictable consumption, requires a better monitoring and network flexibility.

Solution

In response to this challenge, Engineering participates to the PlatOne project leading the design and development of a Blockchain based Marketplace platform to guarantee energy flexibility and a safe monitoring of consumption, putting the user at the heart of the network. This platform will enable innovative services, such as the Peer to Peer energy exchange between users, will lower traditional market access barriers and will allow all the players in the network to trust on more reliable measures.

Smart Transportation

Blockchain for Digital Airports

USE CASE

Business Challenge

One of the challenges daily faced by every airport is that of safety: it is increasingly necessary to adopt solutions that guarantee an effective and accurate monitoring of the passengers' flow, but that, at the same time, are not time-consuming for travelers.

Solution

Our solution is an app for frequent flyers where it is possible to register all the personal information, travel information, passports and documents, which are encrypted, inserted in the Blockchain network and made available through a QR code. Travelers scan the code at the check-in steps and just take a selfie to confirm their identity. In this way, passengers are monitored rapidly and safely.

Blockchain for Ticket Refunding

USE CASE

Business Challenge

Tickets refund process is usually very slow, it requires various documents and worsens the customer experience. Moreover, transport companies often receive fines from consumer protection authorities linked to errors in the refund process.

Solution

Using Blockchain technology, it is possible to provide travelers with an app that verifies their need for refund on company's servers, if it is confirmed, it delivers the amount directly via app and allows the customer to book a new means of transport, even from other companies. It is possible since the Blockchain network is shared between different companies, that now can trust on reliable data about their passengers.





Digital Media & Communication

Blockchain for Creative Industry

Business Challenge

In the Digital Media and Creative industries copyright enforcement is difficult to be managed and the online world has made it harder. Copyrights on creative contents (music, movies, pictures) are often ignored or infringed, being shared or showed without authorization.

Solution

Using Blockchain it is possible to manage and track the complete media contents value-chain: creation, rights management and distribution of media contents. The solution we propose is based upon Ethereum Blockchain infrastructure and permits to archive the full set of data related to the media contents. In this way, having a reliable and univocal proof of the content and its owner, copyright enforcement could be more effective.

USE CASE

Blockchain for B2B Interactions

Business Challenge

For companies that manage projects and activities with many partners, often in different ways and through undocumented ways (e.g. by phone), it could be difficult to provide documentary evidence, as in the case of telecommunications companies. The risk is that customers may not trust these interactions.

Solution

Leveraging Blockchain technology it is possible to record the origin of the communications and the resulting documentation by sharing all the information with the interlocutors, who compose the nodes of the network. In this way the documentation is notarized by the Blockchain, it is available for all the users and can also be used in case of disputes.

USE CASE

Augmented City

Blockchain for E-mobility

Business Challenge

E-mobility and distributed renewable energy sources will be part of our future. However, the latter are characterized by intermittent and non-programmable energy. This aspect, combined with high demand loads, reduces the balancing of the Energy network and limits the possibility to optimally integrate car charging stations and renewable energy sources.

Solution

Blockchain could solve this issue, supporting the management and the balancing of demand and supply peaks of energy. Engineering is working on this field, coordinating eDREAM: an international project in the Smart Energy field, that creates a platform for Demand Response, allowing Distribution System Operators to leverage various third-party energy resources. Blockchain ensures safe data handling, market-based microgrid control and near real time Demand Response verification, improving the monitoring and allowing fair transactions.

Blockchain for management of collection

Business Challenge

La gestione delle riscossioni per gli Enti Pubblici ha come suo passaggio determinante la possibilità di operare degli sgravi sugli importi che il cittadino deve versare. Questa attività si basa sulla discrezionalità nella concessione degli sgravi ed è in capo all'operatore di sportello.

Solution

We have created a platform for the complete management of monitoring activities related to collections. It allows a clear and structured data analysis process with the certification of information on the Blockchain. Through the notarization of the data, each tax relief made has the certain date, the operator code and the certainty that the archived data cannot be changed.

THE WORLD THAT LOOKS AFTER US

Smart Government

CAPE: compliance with GDPR

Business Challenge

GDPR has revolutionized the field of personal data protection. Indeed, while the usage of data can generate multiple social and economic benefits, at the same time it is necessary to ensure regulatory compliance for the collection, storage and transmission of personal data.

Solution

Engineering faces this challenge by combining two proprietary assets, CaPe and Value-Chain, to create a solution that supports the end-to-end process of consent management by providing data subjects the natural need of data ownership and leveraging the benefits of Blockchain to automatize the "notarization" (certification of authenticity) of their consent. In this way, people can track and monitor the usage of their personal information and data processors can exploit it for the declared and certified business purposes, being safe of the compliance to the GDPR.

Blockchain for reducing bureaucracy

Business Challenge

In order to proceed with a contractual agreement with municipalities, people, professionals (e.g. constructors) and organizations usually request a Letter of Guarantee (LoG) to the Governmental Services, which indicates that the involved parties are eligible and financially secured. However, this procedure is time-consuming and costly.

Solution

Governmental Services could issue a digital certificate of authenticity leveraging Blockchain technology, which permits to archive all the applicant's data (financial amount of the transaction, timeframe, etc.). Then, the certificate is sent online to municipal authorities that cross-check its validity. In case of information update, members of the chain are automatically updated. This solution permits information flows via online, reducing costs related to paper and transportation, permits digital certificate to be crosschecked by multiple public bodies and makes them reliable and not modifiable.



Digital Defense, Aerospace & Homeland Security

Protect ID

Business Challenge

Web permits everyone to use Digital Identities for accessing to many services, often critical (bank accounts, health services, etc.). From this perspective, privacy and identity management are central themes today and side effects of violations can include crimes such as defamation, cyberstalking, economic damage, etc.

Solution

ProtectID deals with these topics and provides a set of models and tools to manage threats related to potential violations of digital identity. It adopts Blockchain, used as a public ledger where stakeholders (data subjects and data controllers/processors) can track the entire lifecycle of a digital identity, from the negotiation of a privacy policy to the erasure of all the related data (“right to be forgotten”).

Blockchain for Antiterrorism

Business Challenge

In big cities, crowded spaces such as malls, train stations, etc. are “soft targets” for terrorist attacks. The availability of large quantities of data in smart cities can make urban systems more responsive against these threats. However, it is necessary to establish a new collaborative approach between national, regional, local institutions.

Solution

Blockchain technology can enhance the collaboration between institutions without requiring any new agency, just a private peer-to-peer network and a distributed ledger paradigm, used as an information bus for members. They can post alerts related to events of interest, which are a digitally signed (i.e. sealed and non-refutable) record. Inside the record there is a link to a separate document stored on a dedicated and safe facility, containing highly sensible data in encrypted form.

E-Health

InteropEHRate

Business Challenge

Today the exchange of clinical data between countries is managed by central national authorities, giving poor control to citizens on their data and using many different languages and standards. However, we are living in a period of increasing international mobility, in which a more efficient exchange of information is needed.

Solution

Related to this issue, Engineering is leading the InteropEHRate project, aimed at extending the current European architecture for cross-border exchange of health data. The objective is to permit citizens to manage and safely store their personal health data directly on smartphones and exchange them with healthcare operators and researchers. InteropEHRate is also exploring the Blockchain technology to provide additional authorization mechanisms for more secure exchange of health data.

Blockchain for Vaccination monitoring

Business Challenge

All over the world there is skepticism about vaccine safety, because of counterfeiting, broken supply chains and human errors. A precise management of the vaccine supply chain needs to take into consideration different actors and information asymmetry.

Solution

To solve this issue, it is possible to use Blockchain technology, under the “Proof-of-Authority” protocol, to automatically register and to notarize all the events and data related to the vaccine administration, connecting vaccine’s ambulatory, hospital pharmacies, local warehouses and doctors, who can now rely on reliable and shared data, reducing administrative work and human errors.



THE WORLD WE WORK IN

Digital Industry

FAR-EDGE

Business Challenge

Today, the manufacturing sector needs to move towards an Industry 4.0 vision by increasing automation, streamlining manufacturing processes and facilitating new production models and trends (e.g. mass-customization and reshoring).

Solution

FAR-EDGE introduces an open digital platform for factory automation based on various emerging technologies. Between them, Blockchain (mainly its "distributed consensus" function) has a relevant role: it permits to decentralize the responsibility of the production process, which is delegated to smart machines able to work together in an autonomous way, without a central coordination point and within a well-defined system of common rules.

Blockchain for an excellence in paper production

Business Challenge

The management of purchase invoices and RDAs has an articulated process in relation to the size of the company. There are workflows for the approval and management of the processing of the documentation.

Solution

For a company that has been an excellence in paper production for decades, we have created a complete solution for managing RDA and invoices, automated workflows and defined processes. Every request for approval, all changes of status of the document, access to the platform and the authorizations granted are stored on the blockchain: this always guarantees traceability and to be able to trace the complete history of the practice at any time.



Digital Finance

Blockchain for Digital Payment

Business Challenge

Today digital payment systems are broadly diffused. Huge global operators built their closed ecosystems, while all the others (mostly banks) may strongly benefit from interoperability: their customers would appreciate the capability of using one single electronic wallet for mobile payments in any shop. An inter-circuit network is needed.

Solution

The solution can be a B2B settlement circuit, based on a private Blockchain infrastructure and operated by a consortium of digital payment companies. It provides a lightweight, robust, secure, cheap to use and vendor-neutral distributed ledger of “I Owe You” statements, issued by one company to acknowledge debt towards another. A new record is posted on the ledger each time a mobile wallet application delivers a digital payment to a “foreign” Point of Sale (POS).

Blockchain for Credit Bureaus

Business Challenge

To date, credit institutions contribute free of charge to feed Credit Bureau agencies’ database, archives managed by public authorities and private companies, that collect information about credits and debts for the banking and financial system. However, even if they contribute free of charge, institutions must pay a commission to the private Credit Bureau agencies for each request, if it is below the threshold managed by the public authorities, as they are the only ones to have this information.

Solution

Through Blockchain technology, it is possible to manage the exchange of data using smart contracts, containing information relating to the different nodes. The nodes correspond to the credit institutions, which, in addition to providing the data of their customers, contribute to validating the truthfulness of the information. As the nodes and information entered grow, the security of the Blockchain will increase. In this way, lenders can dispense with a central authority and manage credit data independently, through smart contracts, deciding any premium policies (fees) on the data provided to the system.



Digital Retail & Fashion

Blockchain for Fashion

Business Challenge

For fashion companies, especially those in the luxury segment, the spread of counterfeit product is a threat that can harm their brands' reputation. It is of paramount importance to make the customer feeling the uniqueness of the luxury product purchased.

Solution

Through authorized devices, suppliers and artisans can acquire photos of raw materials and semifinished products along the entire production process. This information is safely stored inside the company's database using Blockchain and, in this way, it is possible to trace the entire history of the products and even their movements in second-hand markets.

Blockchain for Loyalty Programs

Business Challenge

Loyalty programs are increasing today, customers are strongly interested. However, they would be happy to effectively collect and spend their loyalty points, but today a very high percentage of points are not claimed, especially due to the many loyalty programs and the low range of prizes.

Solution

The solution could be a loyalty Platform based on Blockchain for the exchange of tokens between organizations (belonging to the same network) and customers. It would permit customers to use tokens in multiple loyalty programs and make transactions that are tracked in an immutable, distributed and time-stamped distributed database. For example, in Coordinet (a research project focused in the Smart Energy field) we are implementing a similar platform for the exchange of tokens between customers as a compensation for energy services.

Smart Agriculture

Sofie

Business Challenge

Producers, distributors, logistics and retailers want their products to reach the market quickly and in the best possible condition. Consumers want to buy high-quality products and know how these were produced, where they came from and what their ingredients are.

Solution

Our solution provides a business platform that exploits data originated from the IoT infrastructure and related to products, allowing their secure exchange using Blockchain technology. SOFIE fosters collaboration and enhance the transparency of the information shared among different companies working in the supply chain. In this way goods are traced and notarized, satisfying both organizations and food consumers.

Demeter

Business Challenge

Dairy farmers' revenues are directly linked to the quality of the milk provided, which is closely related to animal welfare, including eating and resting conditions. In parallel, consumers want to have the complete visibility of the milk production chain, from animal welfare and origin to proven milk quality along the entire chain.

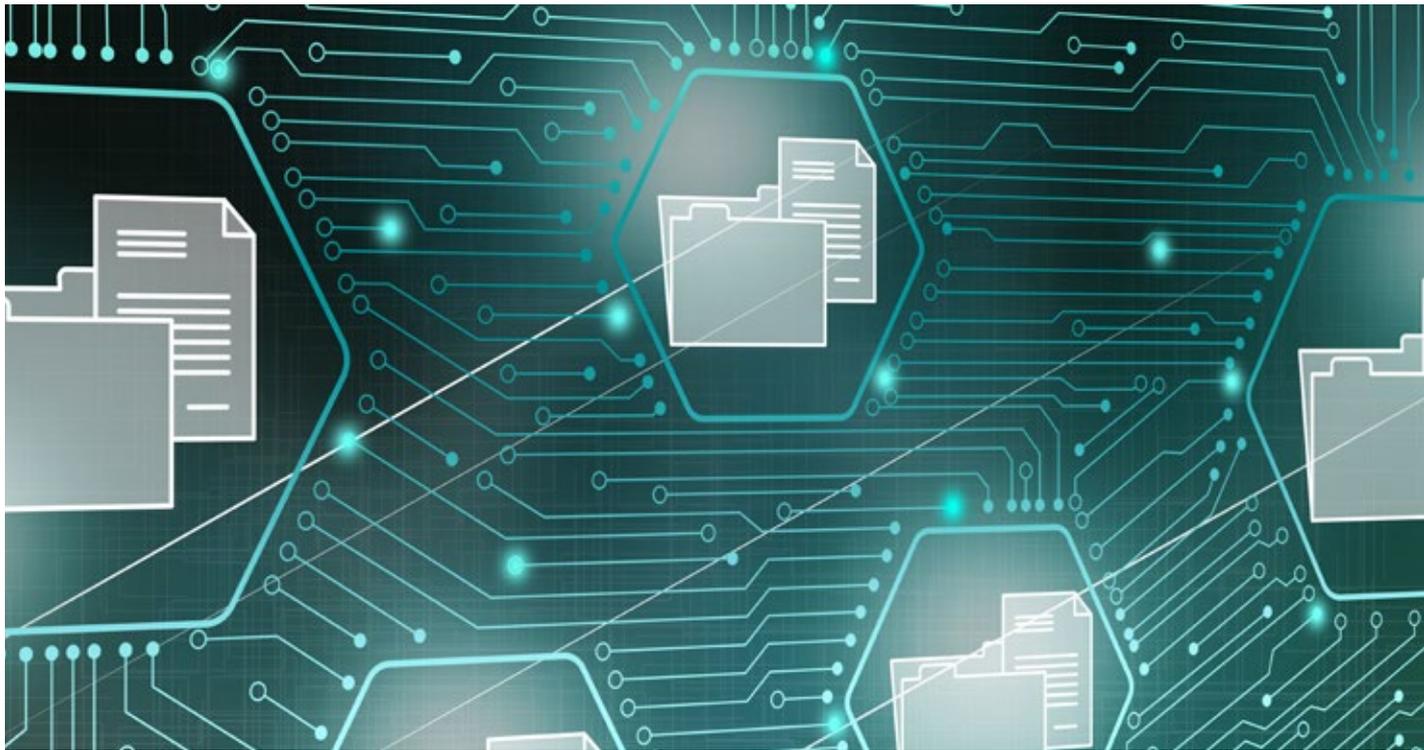
Solution

Engineering, together with farmers, food processors and technology companies, is leading a pilot, Demeter, for a Blockchain based traceability system which collects data across the supply chain, starting from milk production (i.e. animal welfare and milk quality data), through milk transportation (i.e. temperature), processing (i.e. quality of the final product) up to product labelling. Blockchain technology permits to safeguard the quality metrics, improving their reliability.



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HOW DO WE APPROACH IT?



At Engineering, we use Blockchain, together with other enabling technologies, as building blocks in the creation and delivery of our digital platforms and solutions. These, based on the most innovative technologies, have allowed us to gain a strong footprint and significant experience across various vertical sectors over the years.

Engineering Blockchain-As-A-Service (EBAAS)

The first approach is based on our proprietary Engineering Blockchain-As-A-Service (EBAAS) platform, a complete service-based system able to offer Blockchain notarization features as a service to other platforms and applications. Our EBAAS platform is a multi-level DLT system which notarizes on a public and permission-less Blockchain (for example, Ethereum or Bitcoin) in a single step and returns a full notarization certification to the caller that can be used for business process purposes. Alternatively, the system can store the data in a standard database, notarize the package on a private and permissioned DLT and, periodically, notarize the set of data on a public and permission-less Blockchain. This second approach is very powerful and flexible, because the user can determine the whole policy and the different levels of notarization. The platform was designed to be used as a service by different caller applications in a very flexible way.

Engineering HyperLab

The second approach is based on our proprietary Engineering services infrastructure called HyperLab. Our Blockchain infrastructure is based on the Hyperledger Fabric open source platform, which is currently the most flexible, secure and production-ready on the market. The infrastructure is multi-tenant, meaning every customer's network operates within its own private partition, where data confidentiality is enforced at the platform level. We manage all the nodes of the infrastructure in our private Cloud, which would be otherwise distributed among all members of the business networks. HyperLab also enables the rapid, cost-effective and secure deployment of new decentralized applications on a dedicated Blockchain network, without the need to own and operate any particular node.

Where do we apply it?



The main benefits of the HyperLab approach are:

- Enhanced trust between business partners
- Maximum security of sensitive data
- High availability of critical applications
- Significant reduction of costs
- No long-term commitment required
- No need for specialized system administration skills.

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HOW WILL IT EVOLVE?

From our Innovation Observatory

Blockchain's actual coming of age will be when we are able to develop mature and focused ways in which it can actually be applied. This is the real future of this enabling technology.

Capitalizing on hype and replacing expectations with results are what a vibrant and global community of Blockchain users and researchers, including ourselves, are attempting to do. We are continuously testing, pushing and exploring the borders of this technology.

In all fields, from Retail to Agriculture, from Healthcare to Manufacturing, use cases are being developed. We believe the future of Blockchain is coming. Just one example, our Enegan project is quickly moving from prototype to production.

At Engineering, we are enriching our competencies by developing new skills and applications, not only internally, but also by investing and collaborating with innovative startups working in this field. Vemini is another example of what the future of this technology could look like. We collaborated with this startup on a project to connect distributed ledgers, biometrics and Internet of Things, as a result creating a new paradigm of recognition and authentication.

Vemini issues and verifies a digital biometric identity, which can be managed in a decentralized way by individual users, thanks to DLT. Users can have full possession of their digital identity, using biometric vectors (e.g. fingerprint, palm veins, face recognition) as a unique key for secure access to any digital or physical space (offices, stadiums, airports, etc.), or for payments and withdrawals. The solution relies on high levels of Cybersecurity and permits in order to replace cards, codes, pins, tokens, passwords, usernames and/or badges that can be lost, replicated, cloned or obtained fraudulently. Just another example of what we are working on.





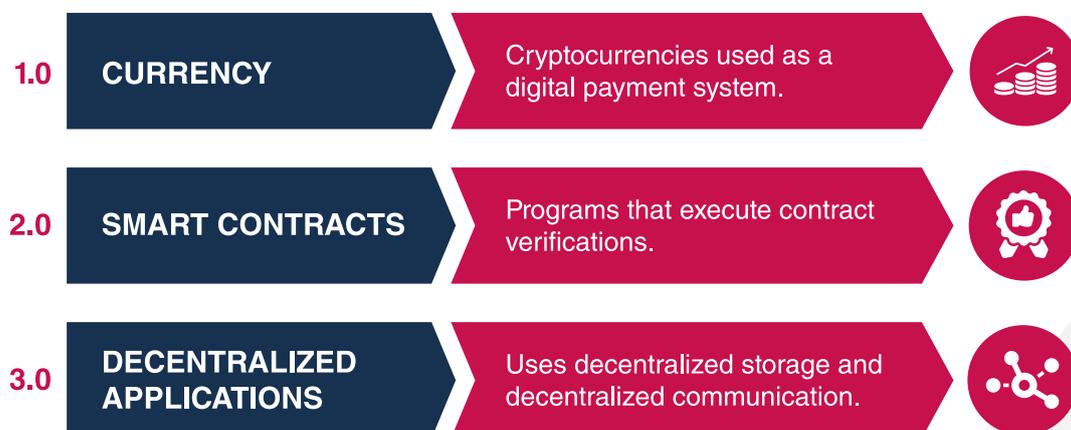
But we are not just focused on following the progression of DLT and Blockchain technologies. On the contrary, we are committed to actively contributing to its advancement and development and delivering it to the world. We participate in the most important international working groups centered on DLT and Blockchain, including the “Focus Group on Application of Distributed Ledger Technology” at the United Nation level and ISO/TC 307’s “Blockchain and distributed ledger technologies” at the global level.

As we have stated in other white papers, we believe that the combination of frontier technologies (along with traditional ones) together with deep core process knowledge is one of the keys to improving the world that future generations will inherit.

Will Blockchain reach maturity and be a visible transformative force? Or will it simply aid us to better focus our efforts on our quest to continuously evolve, improve and even disrupt the way we live and work?

It’s still hard to tell right now, but we’re focused on finding the answer. We sit side by side with our clients and partners, exploring every angle of this new technology to discover new ideas that will disrupt its current limitations.

We believe this is the future of our world. New technologies re-inventing processes, business models, pushing boundaries, improving agility and seeking maturity and solidity. Which, by the way, is exactly what we as Engineering have been doing for the past 40 years.



Future Approach

and stood that test of time. The promise and need to bring transparency and trust into digital transactions is increasingly becoming attractive in today's world, and the key features of Blockchain lend themselves to promising uses in many different sectors.

Blockchain could provide a decentralized global information infrastructure, one in which no one is in full control, no one has absolute power and no one can distort or lie about past or current events. This is a powerful concept.





However, some challenges for the application of Blockchain still remain, such as the limits to the scalability and performance of public Blockchains, or the high consumption of energy in the use of current consensus mechanisms (proofs-of-work). Most of the current research focuses on platform features and use cases, but there is a real need for the field to dwell longer and deeper on the societal implications of this technology and the changes brought on by its use cases to incumbent business models.

As a technology, Blockchain has the potential to change the way transactions are conducted every day around the world. The applications of Blockchain are not limited to cryptocurrencies. This technology is applicable in all environments where some form of transaction is being done. The research on the possibilities of Blockchain in applications is certainly a fascinating and innovative area.

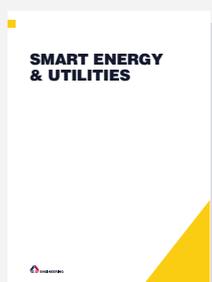
ENGINEERING

Engineering is one of the main players in the field of Digital Transformation of public and private companies and organizations, offering an innovative offer targeted at the main market segments. Together with its subsidiaries, the Engineering Group is committed to pushing the envelope as regards the application of emerging technologies. It also works in the area of system implementation and integration and on redefining processes in order to promote innovation for the benefit of businesses and Public Administrations.

With around 12,000 professionals in 65 locations spread across Italy, Belgium, Germany, Norway, Republic of Serbia, Spain, Sweden, Switzerland, Argentina, Brazil and the USA, Engineering manages projects in over 20 countries, supporting customers in the business areas where digitalization is having the biggest impact. Its products and services cover all strategic sectors, including Digital Finance, Smart Government & E-Health, Augmented Cities, Digital Industry, Smart Energy & Utilities, Digital Media & Communication. The group aims to help change the way in which the world lives and works, by combining technological infrastructures organized in a single hybrid multicloud, the capability to interpret new business models and specialist competences in all next-generation technologies: AI & Advanced Analytics, Cybersecurity, RPA, Digital Twin, IoT, Blockchain. With significant investments in R&D, Engineering plays a leading role in research, by coordinating national and international projects thanks to its team of 450 researchers and data scientists and a network of academic partners and universities throughout Europe. One of the group's key strategic assets is its carefully considered staff training policy. Engineering, since 1999, has had its own dedicated multidisciplinary training academy, the "Enrico Della Valle" School of IT & Management. With 300 certified trainers and hundreds of courses, the School has delivered more than 19,000 days of technical, methodological and process training during the last year.

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Our point of view on



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