



Blockchain Technology & Its Potential Global Impact

A decentralization movement. A disruptive technology. The most advanced data checks-and-balances system yet. Blockchain is transforming commerce.

Most new technologies help companies innovate, become nimbler and drive down costs. Some are truly disruptive. They up-end business models, and in most cases, inspire companies to fundamentally change the way they operate. That is the case with blockchain technology.

Distributed Ledger Technology (DLT) – better known by many as a Blockchain – is being examined by many organizations, and rapidly integrated by a growing number. As the global economy climbs back from the COVID 19 pandemic, supply chain issues are commonplace. While blockchain technology is still early in its adoption cycle, it is likely that many businesses will look for ways to drive supply chain efficiency and lower costs by looking for ways to leverage DLT.

▶ Building Trust Block by Block

At the heart of blockchain platforms is a transactional database. Leveraging user identification labels, people and organizations can trade items like currency, stocks and bonds, products, Intellectual Property (IP), deeds and loyalty points, among many other things of value. It is even being examined for its effectiveness in providing more secure elections.

The blockchain platforms have a secure way to verify transactions before they become approved. If a transaction cannot be verified, it does not take place. Those that are approved, are stored across multiple worldwide servers.

One of the most powerful elements of a blockchain is the use of a continuously growing, distributed record. Each record is linked together in a sequence, and the records are called “blocks.” Each block has a unique marker called a hash. A block contains its hash and a cryptographic hash from a previous block. So, each recorded block is linked to the previous block, forming long chains that are impossible to break. The blocks are distributed through the Internet, creating a nearly unbreakable audit trail that can be tracked.

▶ Blockchain - A C-Suite Business Topic

A Deloitte’s 2020 Global Blockchain Survey reports, “while blockchain was once classified as a technology experiment, it long ago leaped [sic] from theoretical to practical, and many executives recognize it as a true agent of change.” A recent Gartner survey supports an upward trend, revealing 14% of enterprise blockchain projects moved into production in 2020, up from 5% in 2019.

The momentum is likely to accelerate. According to the International Data Corporation (IDC), an estimated \$6.6 billion will be spent on blockchain solutions in 2021, an increase of 50% over 2020. IDC also projects a 5-year CAGR of 48% from 2020 to 2024, which would elevate worldwide blockchain spending to \$19 billion annually. The “Time for Trust” report by PricewaterhouseCoopers (PWC) estimates blockchain has the potential to add \$1.76 trillion to the global economy and could create approximately 40 million global jobs by 2030.

▶ Blockchain's Origins

The concept of a blockchain has circulated for more than a decade. Blockchain’s founder — using the pseudonym Satoshi Nakamoto — created a blockchain platform as the public transaction ledger for the Bitcoin cryptocurrency.

In October of 2008, Nakamoto published a whitepaper, "Bitcoin: A Peer-to-Peer Electronic Cash System," on the cryptography mailing list describing digital cryptocurrency. Leveraging a blockchain-based, public transaction ledger, Nakamoto is also credited as the 1st entity to solve the double-spending problem for digital currency by using a Peer-to-Peer (P2P) network.

Other developers quickly realized the potential benefits of DLT. Since then, many projects, experiments, studies, and applications have been based on blockchain. It is enabling more secure and timely cross-border payments, securing medical records, creating digital identifications (IDs), recording real estate transactions, tracking prescriptions, certifying weapons purchases; and more recently monitoring the COVID-19 vaccine supply chain. By leveraging blockchain platforms, direct P2P interactions happen quickly and securely. As transactions are accepted and recorded in the ledger, they are distributed across the ecosystem.

▶ **Permissioned vs. Permissionless Blockchains**

Using cryptocurrency as an example, "permissionless" blockchains allow anyone to join and have full access to use them. Anyone can buy Bitcoin or ether because these are public, wide-open, permissionless blockchains.

Business blockchains tend to be "permissioned." This means individuals and organizations meet certain requirements to perform specific actions on the blockchain. Some permissioned blockchains restrict access to pre-verified users who have proven their identity. Other enterprise blockchains allow anyone to join, but only let trusted identities verify transactions on the blockchain. For example, if a blockchain's purpose is to manage a database, it is permissioned because most likely everyone accessing the blockchain is an employee or trusted business partner.

▶ **Open Source is the Foundation for Blockchain Platforms**

It may seem surprising that blockchain platforms — which are known for their security — are built on Open Source Software (OSS) code. However, it is the collaborative and transparent characteristics of Open Source that foster blockchain platforms' security, reliability and rapid adoption.

In fact, most financial services platforms, banking and communications networks, cloud computing services, search engines, mobile devices and industrial & control solutions leverage the reliability, scalability and security provided by Open Source.

The most popular Operating System (OS), Linux, is Open Source. It powers the servers for many of the services people use throughout their day. Embedded Linux, another flavor of the Open-Source OS, is inside numerous consumers, businesses and industrial devices that are the foundation for Internet-of-Things (IoT) platforms. Numerous businesses leverage Linux and other Open Source projects because it is not owned by any one company, but a community of global developers, distributors and users. It is free to use and maintained by the collaborative efforts of thousands of developers that range from independent contributors to global technology companies.

Much of the software code for blockchain and cryptocurrency has been developed using OSS which enables developers to easily craft decentralized platforms and is foundational to the safety, security and spectrum of transactions in the blockchain.

▶ Promoting Patent Non-Aggression in Blockchain & Open Source

Blockchain, like OSS development and usage, is an irreversible trend. Today, Open Source code is so effective and cost efficient it is used in more than 90% of all software, according to opensource.com. In fact, it is impossible to catalog all the daily touch points the average person has with an Open Source-powered product or service.

Open Invention Network (OIN) was created to promote Open Source development and use while providing a "patent no-fly zone" around the core of Linux. OIN utilizes a free license to require its community member companies to forebear litigation and cross license patents in the core of Linux and adjacent OSS. In the 15 years since its formation, the organization has grown into the largest patent non-aggression community in history with nearly 3,500 participant companies which own nearly 3 million patents.

In addition to administering the highly successful royalty-free free license, OIN has been one of the most active users of the American Invents Act's (AIA) pre-issuance submission program. Through its actions, OIN has prevented the grant of hundreds of patent applications with overly-broad claims that — if issued as submitted — would have threatened Linux technology and products for years to come. The community-based organization also routinely uses its central role as guardian of patent freedom in the Open Source community to gather critical prior art to neutralize Linux-related litigation and pre-litigation patent assertions.

The blockchain industry has the potential to be a significant driver of innovation and growth for the global economy. For this reason, OIN has included core blockchain Open Source technology from Hyperledger in its cross license, thereby insulating its community licensees from patent risk in this area. As the threat landscape morphs and new threats arise from the ranks of operating companies and Patent Assertion Entities (PAEs), OIN will remain vigilant to ensure fewer poor-quality patents are issued and already granted patents of poor quality are invalidated as the community of companies pledging patent non-aggression in the core of Linux and blockchain continues to grow.

▶ Blockchain Technology is Solving Real-World Problems

Here's a look at the different ways several of OIN's enterprise members are integrating blockchain in their global and everyday operations, consumer products and customer services. We also examine how they are influencing the industry and contributing to future applications.

- ◆ **Alibaba | Retail & eCommerce** — Alibaba is a Chinese multinational company specializing in eCommerce, retail, Internet and technology. It is a leading platform for global wholesale trade. It serves millions of buyers and suppliers around the world.

Alibaba continues to integrate blockchain into its cross-border eCommerce platform Kaola, one of the largest digital platforms that sells imported goods in China. It uses blockchain by placing a traceability icon on the order page after consumers make a purchase. For physical tracking of goods, imported products are tagged with a 2-dimensional code and anti-counterfeit fingerprints such as chemical tagging, or laser etching. The blockchain tracks the movement of goods from suppliers to its online listing and on to the customer.

In addition, Alibaba Cloud has a Blockchain-as-a-Service (BaaS) offering, which supports Hyperledger Fabric, AntChain and Quorum. Alibaba also operates a blockchain for charities — Charities on the Chain — to provide transparency to donors and beneficiaries and to keep track of donations.

- ◆ **Ant Group | Banking & Financial Services** — Ant Group is a leading developer of open platforms for technology-driven, inclusive financial services. It is the parent company of China's largest digital payment platform, Alipay. Ant Group has created Trusple, an international trade and financial service platform powered by AntChain, the company's blockchain-based technology solutions. Trusple aims to make it easier and less costly for all participants – especially Small-to-Medium Enterprises (SMEs) – to sell their products and services to customers around the world. It also reduces costs for financial institutions so they can better serve SMEs in need.

Trusple looks to eliminate the lack of trust among global trading partners that has traditionally made it difficult for many SMEs to do business. For buyers and sellers alike, this lack of trust can lead to delays in shipments and payment settlements, in turn placing pressure on SMEs' financial position and cashflow. Banks that support global trading by SMEs have also faced a longstanding challenge of verifying the authenticity of orders, which has increased banking costs. To tackle these challenges in global trade, Trusple leverages AntChain's key technologies, including Artificial Intelligence (AI), IoT and secure computation, to build trust among multiple parties.

- ◆ **Baidu | Internet** — *"Top 20 Promising Blockchain Projects of 2021" — 101Blockchains.com*
One of the largest AI and Internet companies in the world and the provider of China's dominant search engine, Baidu has developed a (BaaS) offering, the Baidu Blockchain Engine (BBE). The BaaS platform supports 3 blockchain protocols — a permissioned version of Ethereum, Hyperledger Fabric and Baidu's XuperChain, which the company is open-sourcing. BBE is built on top of Baidu Cloud's ABC strategy — AI, Big Data and Cloud — and the company lists numerous applications, including IoT, hazardous chemical logistics, financial collection, asset securitization, sharing financial data and consumer finance.

When Baidu announced BBE, it emphasized its hazardous chemical solution. For everyone's safety, chemicals should only travel along planned routes, transporters need to drive safely, and trucks need to be in good condition. Blockchain tracks and shares the vehicle data. A security chip in each vehicle prevents drivers from tampering with data. At the end of the day, all parties are privy to the route of the cargo and whether the driver maintained appropriate speeds. The vehicle certification also captures a digital signature, identifying the source to make forgery harder.

- ◆ **Daimler | Automotive** — *"Top 20 Promising Blockchain Projects of 2021" — 101Blockchains.com*
Daimler is a German multinational automotive corporation and one of the world's leading car and truck manufacturers — known the world over as the purveyor of Mercedes-Benz. The company has established its blockchain factory within the Daimler Financial Services (DFS) group. In addition, Mercedes-Benz Cars has developed a blockchain prototype, together with Icertis — a leading provider of cloud-based enterprise contract management solutions — to ensure consistent documentation of contracts along its supply chain. The objective is to impart and monitor Daimler standards and contractual obligations to its direct suppliers for working conditions, human rights, environmental protection, security, business ethics and compliance. Any deviations from the agreements are visible in the blockchain.

The Mercedes-Benz Cars division envisions a carbon-neutral, new passenger car fleet in less than 20 years. Together with Circular — a British venture and another OIN community member — that helps companies map transparent supply chains by tracking raw materials using blockchain technology —

the companies are conducting a pilot project for Carbon Dioxide (CO₂) emissions transparency. Specifically, in the cobalt supply chain as part of STARTUP AUTOBAHN. Blockchain technology tracks the emissions of climate-relevant gases, as well as the amount of secondary material along the complex supply chains of battery cell manufacturers. The data is recorded and Daimler sustainability standards are accessible throughout the entire supply chain.

- ◆ **Hitachi | Electronics** — Hitachi, a premier member of Hyperledger since it was established and a contributor to the release of Hyperledger Fabric 1.0 in 2017 — believes blockchain technologies can be used to restructure social infrastructures. The Japanese multinational conglomerate is working on developing of a global standard for blockchain functionality adding responsibilities for institutions and examining use cases of services that interconnect different types of businesses.
- ◆ **IBM | Computer Hardware** — “*Top 20 Promising Blockchain Projects of 2021*” — *101Blockchains.com*
A founding member of OIN, IBM is the largest company in the world embracing blockchain. It has invested over \$200 million in Research & Development (R&D) to explore how it can incorporate Hyperledger — a global enterprise blockchain project hosted by the Linux Foundation. Hyperledger offers the necessary framework, standards, guidelines and tools to build Open Source blockchains and related applications, as well as the IBM cloud into their systems.

IBM's Digital Health Pass uses blockchain to help organizations with verifying individuals' COVID-19 tests. Pharmacies and labs can issue verifiable credentials to a person's smartphone; individuals can share those with an organization as proof of health status, and verifiers can confirm the health and safety of employees, or others as they enter a facility. Since privacy and security are critical factors, the Digital Health Pass is built using IBM's blockchain technology and a decentralized identity architecture. This allows people to become active participants, giving them control over their data and the ability to choose how they use, or share it with others,

IBM has also developed the Food Trust Blockchain. Historically, it has taken weeks to find the source of such outbreaks as E. coli, Salmonella, or Listeria. Food Trust Blockchain offers the ability to track a food product from its origin and every stop along the way until its destination. IBM is not alone. The food industry is adopting blockchain technology, according to *Forbes*, because if something is contaminated, the source can quickly be determined and potentially save lives.

- ◆ **LG Electronics | Consumer Electronics** — a longtime OIN member — is a multinational electronics company, part of the 4th largest chaebol in South Korea (LG Corporation) and the world's 4th largest LCD television manufacturer. The company offers solutions and new experiences through its innovation, helping people lead better lives. Among its products, LG provides home and air appliances, home entertainment, mobile communications, vehicle components and business solutions. The company's in-house blockchain, Monachain, provides digital authentication, digital currency and digital supply chain management, according to the *Korea Times*.

LG CNS, the software subsidiary, is planning to deploy it for digital identity to enable money transfers and payment. Users will be able to create their own digital wallet and the enterprise is talking to banks about community tokens.

Additionally, LG has plans to use Monachain in supply chains. “Monachain can help business owners boost productivity as the company provides a digital supply chain management system that enables suppliers to manage the entire production processing efficiently,” said the company.

- ◆ **Microsoft | Computer Software** — “Top 20 Promising Blockchain Projects of 2021” — 101Blockchains.com
Microsoft was among the 1st companies to accept Bitcoin payments. Today, the software giant's blockchain-based solution, Microsoft Azure, helps Xbox gaming partners and content creators by producing contracts faster with AI and seamlessly generating statements and invoices with Enterprise Resource Planning (ERP) applications. Ernst & Young and Microsoft told *Blockchain Technology* that Azure reduced processing time by 99%, managing 2 million transactions per day and delivering 100% near real-time calculation of royalties using blockchain and smart contracts.
- ◆ **NEC | Information Technology** — A leader in AI and biometric technologies such as fingerprint identification and facial recognition, Japanese-based NEC began its R&D of blockchain technologies in 2012. Today, the company believes blockchain is well developed and has integrated it into its daily use. Executives say blockchain provides superior security against attacks, delivers high performance for payments, offers privacy guarantees for transactions and is easily integrated into such technologies as smartphones and IT devices.
- ◆ **Tencent | Media & Entertainment** — “Top 20 Promising Blockchain Projects of 2021” — 101Blockchains.com
Tencent is the world's largest video game vendor, is among the largest social media platform providers and Venture Capital (VC) and investment corporations, and is best known for its WeChat messaging app. According to *Ledger Insights*, Tencent is 3rd on the list of the “Top Chinese Enterprise Blockchain Firms,” and has been active with blockchain technologies for many years. Tencent told Reuters in 2020, it would invest \$70 billion over the next 5 years in technology infrastructure, including blockchain.

Among some of Tencent's initiatives are a blockchain accelerator to mentor other companies; launching a DLT-powered invoice system and receiving permission from the Hong Kong regulator for a blockchain-based virtual bank. Tencent Cloud has also established an alliance to specifically promote the development of the blockchain industry.

▶ Unlocking the Potential of Blockchain

After many years of evolution, there are many blockchain projects and ideas under development. As evidenced above, many have already captured the attention of people and industries all over the world. As more blockchain-related technologies are created and implemented, the benefits — and potential — are shifting the ways individuals, businesses and governments conduct transactions. From improving and transforming business processes to privately and securely storing patients' medical records, blockchain reduces labor costs, human error, and time. It reduces unnecessary transaction fees, provides extra security layers ensuring the safety of transactions, eliminates the need for a go-between, streamlines supply chains and increases transparency, which in turn builds trust among participants.

Blockchain has the potential to not only impact widespread digital transformation and influence business infrastructures, but to create a far more efficient, digital-based, global economy than what we have today. The options appear to be unlimited. Blockchain technology can potentially spark previously unimagined industries and generate trillions-of-dollars in new revenue opportunities.

GAME-CHANGING BLOCKCHAIN TECHNOLOGIES

HYPERLEDGER

Hyperledger — established in 2016 by 30 founding corporate members and hosted by the Linux Foundation — is a global Open Source community that takes a modular approach to develop stable frameworks, tools and libraries for enterprise-grade blockchain deployments. Businesses and individuals can download and use the software free-of-charge without becoming a Hyperledger community member.

The collective group advances industry goals for distributed ledgers and smart contracts by:

- ▶ Creating enterprise grade, Open Source, distributed ledger frameworks and code bases to support business transactions
- ▶ Providing neutral, open and community-driven infrastructure supported by technical and business governance
- ▶ Building technical communities to develop blockchain and shared ledger Proof of Concepts (POCs), use cases, field trails and deployments
- ▶ Educating the public about blockchain technology market opportunities
- ▶ Promoting the Hyperledger community

An overview of the Linux Foundation HyperLedger projects, of which many OIN members are founders and community participants.

