

What is Blockchain?



In our technology-driven society, lots of new ideas get thrown around, dragging buzzwords behind them. Every week, some new app or algorithm comes along promising to revolutionize, simplify, and enhance our lives. Some are flashes in the proverbial pan—nuclear-powered vacuum cleaners, anyone?—but others make themselves at home with confidence unfettered by the need for deep understanding by the ever-growing number of people using them. They go about their business, subtly altering the fabric of our reality until one day we look around and realize they really have changed the way we live. The blockchain revolution is one such new technology.

Some call it the next generation of the Internet. Others view it as the foundation of an entirely new way of sharing information, controlling intellectual property, and conducting transactions. However you see it, understanding how blockchain works is the first step to harnessing its power for your business.

Basics of the Blockchain

Given all the ink, television, and Web space dedicated to covering blockchain technology (BTC), it's surprisingly difficult to get a plain English explanation of what it actually *does*. Launched in 2009 by an individual (or, for all the world knows, a group of individuals) going by the pseudonym Satoshi Nakamoto to support the Bitcoin digital currency, the blockchain is an encrypted,

decentralized, distributed database used to manage a shared set of records. Nakamoto didn't truly *invent* blockchain, so much as adapt existing *distributed ledger* technology invented in the '90s to protect documents with time stamps to prevent tampering, back-dating, and fraud.

If that sounds like a wagonload of jargon, take heart. Visualizing the blockchain as an actual chain can help, especially if you break things down a bit:

1. Each record in the database is known as a block. These blocks are the links in the chain, each a self-contained set of information arranged and secured in a very special way to prevent tampering. Inside of each block is:

- **Block Data.** This is the actual valuable content of the record. It could be an amount of Bitcoins, for example, or it could be digital identity information, medical records, or even a ballot submitted to an electronic voting system. The data will also record ownership information, sender and receiver information, and a timestamp.
- **Block Hash.** This computer-generated code is created using a unique algorithm, and is permanently tied to the block once the block enters the chain. The hash is the digital "fingerprint" of the block. For Bitcoin transactions (and other cryptocurrencies), the hash can be used to generate a public key, which is connected to a separate private key used to verify ownership and allow access to funds held in a specific record.
- **Hash of the Previous Block.** In addition to its own hash, the block contains the hash for the previous block. This creates an easy way to trace entries and verify the validity of both a block and the chain as a whole, since tampering with one block will invalidate all the blocks that follow, and directly reference, it.
Note: The first block in a chain is called the Genesis block, and uses a special signifier rather than a previous block hash, since it doesn't have a previous block to reference.
- **Special Content.** In addition, each record in the chain of blocks may contain a special "seal" known as proof of work. This is usually the case with digital currencies. The proof of work seal is used in part to decide which member node will receive a reward paid in Bitcoin cash for adding to the chain in a process called

Bitcoin mining. A proof of work seal is also used to discourage a type of hack called distributed denial-of-service (DDoS) attacks. A DDoS attack is designed to “overload” the system with multiple fake requests, and proof of work is a special mathematical barrier erected to slow requests by eating up computing power. A variation of proof of work called proof of stake relies instead upon the amount of investment each member node holds to assign a monetary reward for adding to the chain.

2. The “chain” portion of “blockchain” is the public, distributed network of computers. Participants collectively agree to maintain the database. Each member of this network—also called a blockchain network—is called a node, and each node receives its own complete copy of the blockchain database. Every block is generated and verified using an agreed-upon set of rules—the blockchain’s protocol. The network can have thousands or even millions of members, and since tampering with the chain would require overpowering and controlling more than 50% of the total nodes, extremely resistant to illicit changes. The nodes all share responsibility for confirming transactions and hosting the information in the database as a decentralized, living document rather than a single, vulnerable copy hosted by a central authority. Blockchain is what’s known as append only; all changes are recorded sequentially, timestamped, and cross-referenced, so while additions are easy to make, any unauthorized changes are even easier to detect.

Together, these two components create a secure and constantly-updated method for sharing currency, digital documents and content, and sensitive information. And because it’s not tied to third-party verification or control by central banks, other financial institutions, or tech companies like Microsoft, Facebook, or Google, blockchain technology allows a group of individuals to retain highly secure control of their information and transactions without having to worry about transaction fees, data leaks or theft, or gatekeeping.

Currently, both the media and the marketplace have lavished the lion’s share of their coverage on blockchain technology’s use in the digital currency arena. But the true promise of the blockchain lies in its flexibility, security, and accuracy in recording, transferring, and managing data of all kinds.

How Blockchain Works

Thanks to widespread blockchain adoption in support of digital currencies like Bitcoin, Ethereum, and Dogecoin, you've probably paid (or heard about someone else paying) for something using digital currency.

A very common example used to explain the mechanics of the blockchain relies on this familiarity and its comparable "old school" equivalent.

With a traditional bank, if Tom sends Skip \$50, a trusted third party (in this case, the bank) debits Tom's account for \$50 and credits Skip's by the same amount. Both men trust and rely on the bank to handle their money and record the transaction accurately.

With a blockchain application like Ethereum (for example), Tom and Skip do their own record keeping. Each has a copy of the complete blockchain and can see when and for how much the transaction occurred, instantly. The locus of trust is between the two parties sharing data, whether it's currency, information, or digital assets, without the need to rely on a middle-man to ferry it from Sender A to Recipient B—or the risk of exposure and theft that comes with doing so.

Beyond Bitcoin: Can Blockchain Power-Up Your Business?

Currently, both the media and the marketplace have lavished the lion's share of their coverage on blockchain technology's use in the digital currency arena. But the true promise of blockchain solutions lies in their flexibility, security, and accuracy in recording, transferring, and managing data of all kinds.

Some of the most promising blockchain applications include:

- **Smart(er) contracts.** Imagine being able to trade currency, buy or transfer stocks, invest in real estate or businesses, or sell your latest eBook on the open market, instantly, accurately, and transparently—and without a lawyer. Smart contracts are a specialized blockchain protocol that defines and encodes the parameters of an agreement into a block of data, and the conditions under which that agreement is fulfilled, broken, or negated. So if, for example, your smart contract stipulates that ownership documents, or a vendor contract, or what have you will be transferred to you upon receipt of x Bitcoins to a specified account, the

transaction occurs not only instantly, but is recorded, easy to verify (and difficult to alter) by both parties, and doesn't rely on a third party to ensure the t's are crossed and the i's are dotted. More complex examples for smart contracts would be renewal conditions upon reaching a specific expiration date, protocol-protected distribution of intellectual property like albums, films, or games, and new pricing for specific items purchased from a trusted vendor kicking in at certain quantities.

- **More effective procurement solutions.** The same "wallet" style applications popularized by Bitcoin, Ethereum, and other digital currencies can find even greater use within the procurement function of a business. Decentralized, automated, and secure, BTC could connect contract terms with approved vendors directly to a catalog used by approved buyers within an organization, protecting your interests while promoting vendor compliance and incentives. Every transaction would be recorded automatically, and fully documented for auditing, forecasting, and reporting purposes. Rogue spending and fraud would be reduced or even eliminated. Consumer desire for a public and easily searched ledger containing transparent documentation of the materials that go into the goods and services they buy will make blockchain an essential part of responsible business practices. For everything from authentic regional wines to responsibly and ecologically sourced materials for clothing, footwear, and jewelry, the blockchain will make supply chain auditing easier and more reliable than ever before. In addition, data could be easily funneled into both purchasing software and enterprise resource planning (ERP) suites for advanced analysis to support financial planning, process improvement, contract negotiations, and supply chain management.
- **A diverse peer-to-peer economy.** By removing third party arbiters, the blockchain lets businesses large and small deal directly with their customers. Performance, customer service, and product quality will inform reputation, encouraging competition and putting a greater emphasis on reputation than ever before. Everything from ice cream trucks to helicopter rides to weekend house rentals can be negotiated directly on a peer-to-peer network. For businesses, the blockchain could let your procurement department create its own performance-and-price-driven vendor portal connected to your purchasing and ERP systems, constantly evaluating vendors and scaling the supply chain to meet the company's needs with a focus on value and total cost of ownership (TCO)

rather than mere cost reductions. On the other end, efficiency in accepting and verifying payment from clients and customers will be greatly improved, and the data connected to every transaction can be used to drive continuous improvement efforts.

- **Greater data security.** Decentralizing information makes it much harder to lose or hack. It also removes the need for physical storage. For the healthcare and financial industries, decentralization means greater security for personal information and stronger protection against fraud and theft. Companies and individuals will also have much more granular and direct control over their information; in the future, your company and its staff might even have a lucrative income stream from selling social media sites usage, buying, and activity information, or create a protocol that exchanges free advertising on Twitter or Facebook for certain limited and anonymized usage data.
- **The Internet of Things (IoT).** The Internet is escaping its digital borders, and increasingly, we can exercise real world control from a virtual location. Blockchain's flexibility and ability to support code along with data means you can use it to monitor and control everything from temperatures in your IT department's remote server farms to warehouse transfers to pop-up point-of-sale kiosks for your customers to buy your products on demand with cryptocurrency.

Build a Better Business with Blockchain

Versatile, powerful, and ever-expanding, the blockchain will almost certainly be at the core of tomorrow's transformative technologies. Add in security, absolute transparency, and rich potential for deep data analysis, and you've got everything you need to face the challenges of the digital age. Take advantage of blockchain's capabilities, and build stronger relationships, more streamlined and productive practices, and create more value for your company.

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