For English

كيف تعمل تقنية البلوكشين

البلوكشين هو تقنية رقمية مبتكرة تعمل كدفتر مشترك لتسجيل المعاملات بطريقة لامركزية وآمنة وشفافة. بخلاف قواعد البيانات التقليدية التي تتحكم بها جهة واحدة مثل البنوك، يتم نسخ بيانات البلوكشين وتوزيعها على آلاف الحواسيب حول العالم، بحيث يمتلك كل مشارك نسخة كاملة من السجل، ما يجعل التلاعب أو التغيير أمرًا شبه مستحيل. تُجمع المعاملات في كتل تحتوي على تفاصيل العملية والتوقيت وبصمة رقمية فريدة تُعرف بالـ "هاش"، وكل كتلة ترتبط بالتي قبلها، ما يكوّن سلسلة محكمة يصعب اختراقها أو تعديلها.

يعتمد البلوكشين على آليات للتوافق تضمن صحة المعاملات واتفاق جميع المشاركين على النسخة نفسها من السجل. في البيتكوين يُستخدم إثبات العمل حيث يتنافس المعدّنون على حل مسائل رياضية معقدة، بينما تستخدم إيثريوم الحديثة إثبات الحصة الذي يقوم على رهن جزء من العملات كضمان مقابل فرصة للتحقق من المعاملات. هذه الآليات تختلف في استهلاكها للطاقة والسرعة، لكنها تشترك في الهدف الأساسي وهو حماية الشبكة وضمان الموثوقية.

إضافة إلى المعاملات المالية، يوفّر البلوكشين إمكانيات أوسع من خلال العقود الذكية، وهي برامج صغيرة تُخزّن على الشبكة وتُنفّذ تلقائيًا عند تحقق شروط معينة، مثل تحويل قرض عند إيداع مبلغ محدد. هذه العقود تزيل الحاجة إلى الوسطاء وتفتح المجال لتطبيقات متعددة مثل التمويل اللامركزي، الملكية الرقمية، والفنون المشفّرة.

باختصار، البلوكشين ليس مجرد تقنية مرتبطة بالعملات المشفرة، بل هو نظام متكامل يوفر أمانًا وشفافية عالية، يوزع السيطرة بين المشاركين بدلًا من تركها لجهة واحدة، ويُعتبر أساسًا للكثير من الابتكارات الحديثة في الاقتصاد الرقمي.

How Blockchain Technology Works

When people hear the word "blockchain," they often think of Bitcoin or cryptocurrencies. But behind these digital coins lies a powerful system for recording and securing information. Blockchain is designed to be transparent, reliable, and extremely difficult to tamper with. To see why it has become so important, it helps to look closely at how the technology actually works.

The Ledger: A Shared Notebook

At its simplest, blockchain is a ledger, a record of transactions or events. Imagine a notebook that records who paid whom or who owns what. Instead of being stored in one place, like a bank's database, this notebook is copied and shared across thousands of computers around the world. Every participant in the network, known as a node, holds their own copy of the ledger. Whenever a new transaction takes place, all copies of the notebook update so that everyone agrees on the same information. This is what makes blockchain decentralized: no single authority or institution controls the records.

Blocks and Chains

Transactions are grouped together into blocks, which are like pages in the notebook. Once a block is filled with data, it is closed and linked to the block before it, forming a continuous chain of information. Each block contains the list of transactions, the time they occurred, and a special digital fingerprint called a hash. This fingerprint is created using cryptography and is unique to each block. Even a tiny change in the data would completely alter the fingerprint. Because every block also contains the fingerprint of the one before it, the chain is secured link by link. If someone tried to alter a past transaction, they would have to change not just one block but every block after it across thousands of computers at the same time, an almost impossible task.

Consensus: How Everyone Agrees

The next question is how all those computers, scattered around the world, agree on which transactions are valid. This is solved through rules known as consensus mechanisms. In Bitcoin, the system is called Proof of Work. Here, computers known as miners compete to solve very complex puzzles. The first to solve the puzzle adds the new block to the chain and earns a reward in new bitcoins. This process is highly secure but consumes large amounts of electricity.

Newer blockchains, such as Ethereum today, use a different method called Proof of Stake. Instead of solving puzzles, participants put aside some of their cryptocurrency as a kind of deposit, or "stake." The system randomly selects one of them to validate the next block. If they act dishonestly, they lose part of their stake. Proof of Stake is faster and more energy-efficient than Proof of Work, although it tends to give more influence to those who hold more coins. In both cases, the goal is the same: to make sure every honest participant ends up with the same version of the ledger.

How Transactions Are Added

The process of adding a transaction to the blockchain follows a clear sequence. It begins when a user initiates a transaction, such as sending cryptocurrency through their digital wallet. This request is then broadcast to the network of computers, or nodes, that make up the blockchain. The nodes verify the transaction's legitimacy, checking that the sender has enough funds and that the request is properly signed. Verified transactions are placed into a waiting area called the memory pool until miners or validators collect them to form a new block. Depending on the blockchain, miners may then compete to solve a mathematical puzzle, as in Proof of Work, or validators may be chosen to approve the block under Proof of Stake. Once the block is completed and validated, it is permanently added to the chain, cryptographically linked to all previous blocks. At that point, the transaction is confirmed, visible to anyone on the network, and cannot be reversed or altered.

Smart Contracts: Rules Written in Code

Some blockchains go further than just recording transactions. Ethereum, for example, introduced the concept of smart contracts, small computer programs that live on the blockchain. These contracts run automatically once certain conditions are met. A simple example might be: if Alice deposits $100 worth of cryptocurrency, then release a loan of $50. Because the rules are built directly into the blockchain, they cannot be changed, and the contract will execute exactly as written without needing a bank, lawyer, or middleman. This feature makes blockchains much more versatile and has given rise to new areas such as decentralized finance and digital art ownership.

Conclusion

Blockchain is more than just a buzzword. It is a shared digital ledger, built from blocks of information linked together by cryptography, and maintained not by one authority but by an entire network of participants. Consensus rules ensure everyone agrees on the truth, while cryptographic keys allow people to control their assets securely. With the addition of smart contracts, blockchain becomes not only a record of past transactions but also a platform for new digital services. This is the engine that powers cryptocurrencies, stablecoins, and the many innovations we are beginning to see in the digital economy.