

Glossary

Understanding Web3— a primer on the emerging digital asset ecosystem

App-issued tokens

Developers building applications on a blockchain can create tokens for a variety of purposes. There are four main types of tokens issued by decentralized apps: **utility tokens** are used to gain access to and enable consumption of a protocol's services or to bestow certain privileges; **investment tokens** represent ownership in a project or venture and can be thought of as analogous to shares of equity; **governance tokens** permit the holder to vote on issues pertaining to the app's underlying protocol, its business practices, and its strategic direction; and **asset-linked tokens** represent ownership of an underlying asset and include an embedded contract describing the specific ownership terms and utilization rights that will be provided to the token holder.

Bitcoin

Bitcoin is the largest and original blockchain. In the white paper that introduced Bitcoin, published in October 2008 by Satoshi Nakamoto, the anonymous creator(s) of Bitcoin, the author described their vision of a peer-to-peer electronic cash system that would allow online payments to be sent directly from one party to another without having to go through a financial institution or be intermediated in any way.

Blockchain

A blockchain is a digital record or ledger of transactions, duplicated and distributed across an entire network of computer systems. Blockchains represent complete records of all transactions ever performed within that system. Every **node** in the blockchain network has a real-time, simultaneously updating copy of this ledger. Every node sees new blocks of transactions being appended to the existing chain of verified blocks and could re-create the entire sequential history of

transactions on that chain stretching back to the very first (genesis) trade on the ledger. Blockchain is sometimes described as "distributed ledger technology" or DLT.

Blockchain oracles

Blockchain oracles are third-party applications that send, execute and verify data obtained from external centralized sources before submitting that data to **smart contracts**, essentially bridging the gap between smart contracts and the external world.

Consensus mechanism

A consensus mechanism is the collective work of validator nodes on a blockchain to verify the accuracy of each transaction. A "consensus" must be reached across the nodes in the network, and when achieved, the verified data is added in a new block on the blockchain. There are different types of consensus mechanisms, but the two main consensus mechanisms used are **proof-of-work (PoW)** and **proof-of-stake (PoS)**.

Cryptocurrency token

A cryptocurrency or payment token (or coin) is used for payments in the Web3 digital asset economy, just as government issued fiat currencies such as the US dollar, euro or Japanese yen are used for payments in the traditional economy. Similar to nations issuing their own currency, each blockchain can issue its own cryptocurrency in the form of a token. The term cryptocurrency is used because these monies are cryptographically protected so that each token can be identified and tracked to prevent unauthorized movements and duplication.

Cryptocurrency wallet

A cryptocurrency wallet is necessary for token owners to participate in a blockchain ecosystem. This wallet is essentially a piece of software that provides an interface between

the owner and the blockchain. Cryptocurrency wallets are simply addresses on the internet where assets can be stored. There is no identifying information on these wallets other than a long string of letters and numbers. Instead of containing the asset itself, the wallet contains a digital key that is required to unlock and access the holdings in the user's wallet. These keys are only shared when a user authorizes a transaction.

Decentralized applications

Decentralized applications or dApps are digital applications built and run on a blockchain instead of on a single computer. They use open-source code and operate on distributed protocols, which means users can view, audit, and verify how they work and directly engage with them without the need for access credentials and are thus outside the purview and control of a single authority. DApps can be developed for a variety of purposes including gaming, finance and social media. For example, a developer can create a Twitter-like dApp and put it on a blockchain where any user can publish messages. Once posted, no one—including the app creators—can delete the messages.

Decentralized autonomous organizations

Decentralized autonomous organizations (DAO) are web-native, self-governing entities with no central governing body. DAOs execute rules established by its member community, which shares a common goal to act in the best interest of the entity. The rules are written into the code of the organization via **smart contracts**, which form the basis of the DAO's self-governance. DAOs typically create a new governance token that entitles holders to vote on matters of strategic importance. Governance tokens can be earned through community participation or bought by those looking to have a voice.

Decentralized exchanges

Decentralized exchanges are run either by foundations or DAOs. Cryptocurrency holders must have their own digital cryptocurrency wallet to connect to a decentralized exchange. A participant looking to buy or sell a token designates their interest and an automated market maker algorithmically matches bids and offers for specific tokens. All transactions are verified through a consensus mechanism and are listed on a public blockchain. Every node that is a part of the network has transparency into this transactional record.

Decentralized finance

Decentralized Finance (DeFi) is an umbrella term for the global borderless financial system enabled by public blockchains. Instead of relying on centralized intermediaries like banks, stock exchanges, or brokers, DeFi services use smart contracts—self-executing software of encoded rule sets that network participants can inspect and audit for authenticity—to record transactions and transfer funds. Central authority is replaced by group consensus.

Ethereum

Ethereum, developed by Vitalik Buterin, is the second largest L1 blockchain technology that set out to build a new open-source development platform on top of a blockchain payment network where programmers could develop a whole array of applications to operate in a decentralized manner. Ethereum's native cryptocurrency is known as ether, or ETH.

Layer 1 Blockchain

Layer 1 Blockchain (L1) is the foundational layer and main structure of a blockchain network. L1's are the most basic form of blockchain, providing the infrastructure for all other applications and protocols that are built on top of the network. Bitcoin and Ethereum are examples of L1 blockchains.

Layer 2 Blockchain

Layer 2 Blockchain (L2) refers to a secondary framework or protocol that is built on top of an existing blockchain system. The L2 solution for the Bitcoin payment network was developed by Lightning Labs and is referred to as the Lightning network. This network allows two transactors to open a channel with each other by depositing bitcoin and “invoicing” each other. The two nodes can continue to send invoices back and forth so long as the channel is open. When it is closed—by withdrawing the Bitcoin—all of the associated transactions are compressed and reported to the Bitcoin network to be transcribed into the ledger. L2 protocols are built independently and often issue their

own native payment token but rely on the associated L1 Ethereum blockchain—often referred to as the mainnet—for security and recording transactions.

Mining

In proof-of-work (PoW) blockchains, such as Bitcoin—the largest and original blockchain—validators, or “miners,” race to solve an increasingly complex cryptographic puzzle (“mine”). The winner of this race gets to add the block to the chain and earn the block “reward” for having done so. The reward is paid in the native currency of the blockchain. The network automatically mints new currency to pay the miners. This is how the token supply, or money supply, increases in a proof-of-work blockchain.

Minting

Minting is the process of generating new coins through verification of data, creation of new blocks, and documentation of the verified information on a blockchain network via Proof-of-stake consensus mechanism. These newly minted coins are circulated in the market for trading purposes.

Node

A node is a computer or device connected to other computers or devices that run a blockchain's software to validate, store and update the complete history of transactions on the network. Nodes are integral to the blockchain, verifying data to be added to a blockchain via a group consensus mechanism with other nodes, and maintaining the integrity of the network.

Non-fungible tokens

Some tokens are fungible—identical and substitutable—and others representing unique assets are *non-fungible*. Non-Fungible Tokens (NFTs) are a unique, cryptographic unit of data that exists on a distributed ledger and cannot be replicated. They can represent digital media or real-world, tangible assets like artwork and real estate, making buying, selling, and trading more efficient, while reducing the scope for fraud. NFTs can also represent identities, property rights, or even a bundle of rights—all encoded into digital contracts or attestations.

Optimistic rollups

An optimistic rollup is an L2 solution that accumulates a set of trades and assumes that all are valid, running a “fault proof” when they suspect that an invalid transaction may be present. Because they must wait for potential fraud challenges, it can often take significant time to post these transactions to the mainnet. Optimistic rollups look at and transmit all data in a transaction, just like verifiers on the

mainnet. As such, this approach is seen as offering greater security, particularly for transactions that require minimum additional on-chain actions.

Proof-of-stake

Proof-of-stake (PoS) is a consensus mechanism by which validators commit their own capital (stake) as collateral to verify transactions and mint new blocks onto the blockchain. The larger the stake, i.e., the more capital put at risk, the higher the probability of that validator being selected by the protocol to verify a new block of transactions and earn a reward for doing so successfully. In this way, those with the most to lose are most involved in the operation of the system and validators become increasingly invested in the integrity and continued operation of the system.

Proof-of-work

Proof-of-work (PoW) is the consensus mechanism through which Bitcoin and other cryptocurrencies verify new transactions before they are added in a new block to the existing blockchain. Miners race to complete a complex cryptographic puzzle, known as hash functions, to verify and add transactions to the blockchain, in order to earn a reward in the form of new coins or transaction fees.

Protocol

In computer science, protocol refers to the basic set of rules in code that allow data to be shared between computers. In the context of blockchain, protocols are rules that govern a blockchain network—the common communication rules that the network operates according to. Two key protocols are Bitcoin and Ethereum. Their respective protocols establish the structure and operation of their blockchain. Protocols are developed by teams of people such as foundations, private companies, or groups of developers who collaborate to establish rules with parameters that will create the blockchain.

Sidechains

Sidechains are a hybrid between the L1 and L2 solution. Unlike the L2 solutions discussed above, side chains have their own consensus mechanisms and maintain their own blockchain ledger, but they can share transactional details with a mainnet via a two-way bridge. These offerings are becoming increasingly popular for use cases where there is a desire for some centralized oversight, such as restricting the participants able to join into the chain or requiring full Know your customer/anti-money laundering (KYC/AML) for participants.

Smart Contracts

Smart contracts are self-executing contracts in the form of code that are housed on a blockchain. Just as a transaction is recorded on the blockchain, the terms of the transaction are also recorded on the blockchain.

Stablecoin

A stablecoin is a type of token that has its value pegged to another currency, commodity, financial instrument, or basket, and should, if well designed and operated, maintain a steady value, neither appreciating nor depreciating in price. Stablecoins typically tie their value to the US dollar in some way. The collateral pools associated with these stablecoins are primarily, though not exclusively, comprised of government-issued fiat currencies or fiat-denominated fixed income securities.

Staking

Staking is how validators who participate in Proof-of-stake earn rewards. Validators “stake” their cryptos as collateral for a period of time while they verify transactions on a blockchain. One can liken staking to depositing cash in a high-yield savings account: banks lend deposits, and the depositor earns interest on their account balance. Staking rewards are calculated in percentage yields, and returns are typically higher than interest rates offered by traditional banks.

Tokens

Tokens are used to facilitate payments, initiate services, bestow ownership, authorize voting, convey rights, and transfer assets. Specialized tokens are used for each of these functions. Broadly, these specialized tokens can be broken down into two categories: [cryptocurrency tokens](#) and app-issued tokens.

Tokenization

Tokenization is the process of converting, through symbolic representation or encoded rule sets and attestations, something of value into a digital token that can be transacted on a blockchain. These tokens can represent tangible assets like gold, real estate, and art, or intangible assets like voting rights, ownership rights, or content licensing.

Tokenomics

Tokenomics informs the timing of an investment opportunity and highlights short-term influences that may affect token pricing. Tokenomics describes the topic of understanding the supply, demand and economic characteristics of digital assets. This entails a number of considerations and complexities additional to those considered in the valuation of traditional assets.

Web3

Web1 provided users direct access to websites offering previously unimagined amounts of data, access to knowledge, and connectivity. Web2 shifted the customer experience of

the internet, combining new mobile technologies with information networks to allow the upload of user-generated content and leveraging the power of big data and nascent AI technologies to personalize and tailor the delivery of content via specialized apps. Web3 is the next iteration of the world wide web—a decentralized, blockchain-based online ecosystem. Platforms and apps built on Web3 aren't owned or governed by a central authority; rather, they are owned by network participants, who earn their ownership stake by helping to develop and maintain those services.

Zero-knowledge (zk) rollups

A zero-knowledge rollup is a layer 2 blockchain solution that performs computations and storage off-chain while funds are held in a smart contract. They take a different approach than optimistic rollups, using “validity proofs” to compute transactions off-chain, looking at only key data fields. This results in much faster processing times as hundreds of transactions can be compressed before being posted to the mainnet. The term “zero-knowledge” refers to the use of zero-knowledge proofs for on-chain transaction verification without requiring interaction or trust; they are cryptographic proofs that can demonstrate a statement's truth without disclosing any information about the statement itself.

WHAT ARE THE RISKS?

All investments involve risks, including possible loss of principal. The value of investments can go down as well as up, and investors may not get back the full amount invested.

Stock prices fluctuate, sometimes rapidly and dramatically, due to factors affecting individual companies, particular industries or sectors, or general market conditions.

Investments in fast-growing industries like the technology sector (which historically has been volatile) could result in increased price fluctuation, especially over the short term, due to the rapid pace of product change and development and changes in government regulation of companies emphasizing scientific or technological advancement or regulatory approval for new drugs and medical instruments.

Buying and using blockchain-enabled digital currency carries risks, including the loss of principal. Speculative trading in bitcoins and other forms of cryptocurrencies, many of which have exhibited extreme price volatility, carries significant risk. Among other risks, interactions with companies claiming to offer cryptocurrency payment platforms or other cryptocurrency-related products and services may expose users to fraud. Blockchain technology is a new and relatively untested technology and may never be implemented to a scale that provides identifiable benefits. Investing in cryptocurrencies and ICOs is highly speculative and an investor can lose the entire amount of their investment. If a cryptocurrency is deemed a security, it may be deemed to violate federal securities laws. There may be a limited or no secondary market for cryptocurrencies. The opinions are intended solely to provide insight into how securities are analyzed.

The opinions are intended solely to provide insight into how securities are analyzed. The information provided is not a recommendation or individual investment advice for any particular security, strategy, or investment product and is not an indication of the trading intent of any Franklin Templeton managed portfolio. This is not a complete analysis of every material fact regarding any industry, security or investment and should not be viewed as an investment recommendation. This is intended to provide insight into the portfolio selection and research process. Factual statements are taken from sources considered reliable but have not been independently verified for completeness or accuracy. These opinions may not be relied upon as investment advice or as an offer for any particular security.

Any companies and/or case studies referenced herein are used solely for illustrative purposes; any investment may or may not be currently held by any portfolio advised by Franklin Templeton. The information provided is not a recommendation or individual investment advice for any particular security, strategy, or investment product and is not an indication of the trading intent of any Franklin Templeton managed portfolio. **Past performance does not guarantee future results.**

IMPORTANT LEGAL INFORMATION

This material is intended to be of general interest only and should not be construed as individual investment advice or a recommendation or solicitation to buy, sell or hold any security or to adopt any investment strategy. It does not constitute legal or tax advice. This material may not be reproduced, distributed or published without prior written permission from Franklin Templeton.

The views expressed are those of the investment manager and the comments, opinions and analyses are rendered as of the publication date and may change without notice. The underlying assumptions and these views are subject to change based on market and other conditions and may differ from other portfolio managers or of the firm as a whole. The information provided in this material is not intended as a complete analysis of every material fact regarding any country, region or market. There is no assurance that any prediction, projection or forecast on the economy, stock market, bond market or the economic trends of the markets will be realized. The value of investments and the income from them can go down as well as up and you may not get back the full amount that you invested. Past performance is not necessarily indicative nor a guarantee of future performance. All investments involve risks, including possible loss of principal.

Any research and analysis contained in this material has been procured by Franklin Templeton for its own purposes and may be acted upon in that connection and, as such, is provided to you incidentally. Data from third party sources may have been used in the preparation of this material and Franklin Templeton ("FT") has not independently verified, validated or audited such data. Although information has been obtained from sources that Franklin Templeton believes to be reliable, no guarantee can be given as to its accuracy and such information may be incomplete or condensed and may be subject to change at any time without notice. The mention of any individual securities should neither constitute nor be construed as a recommendation to purchase, hold or sell any securities, and the information provided regarding such individual securities (if any) is not a sufficient basis upon which to make an investment decision. FT accepts no liability whatsoever for any loss arising from use of this information and reliance upon the comments, opinions and analyses in the material is at the sole discretion of the user.

Products, services and information may not be available in all jurisdictions and are offered outside the U.S. by other FT affiliates and/or their distributors as local laws and regulation permits. Please consult your own financial professional or Franklin Templeton institutional contact for further information on availability of products and services in your jurisdiction.

Issued in the U.S. by Franklin Distributors, LLC, One Franklin Parkway, San Mateo, California 94403-1906, (800) DIAL BEN/342-5236, franklintempleton.com—Franklin Distributors, LLC, member FINRA/SIPC, is the principal distributor of Franklin Templeton U.S. registered products, which are not FDIC insured; may lose value; and are not bank guaranteed and are available only in jurisdictions where an offer or solicitation of such products is permitted under applicable laws and regulation.

Canada: Issued by Franklin Templeton Investments Corp., 200 King Street West, Suite 1500 Toronto, ON, M5H3T4, Fax: (416) 364-1163, (800) 387-0830, www.franklintempleton.ca.

Offshore Americas: In the U.S., this publication is made available only to financial intermediaries by Franklin Distributors, LLC, member FINRA/SIPC, 100 Fountain Parkway, St. Petersburg, Florida 33716. Tel: (800) 239-3894 (USA Toll-Free), (877) 389-0076 (Canada Toll-Free), and Fax: (727) 299-8736. Investments are not FDIC insured; may lose value; and are not bank guaranteed. Distribution outside the U.S. may be made by Franklin Templeton International Services, S.à r.l. (FTIS) or other sub-distributors, intermediaries, dealers or professional investors that have been engaged by FTIS to distribute shares of Franklin Templeton funds in certain jurisdictions. This is not an offer to sell or a solicitation of an offer to purchase securities in any jurisdiction where it would be illegal to do so.

Issued in Europe by: Franklin Templeton International Services S.à r.l.—Supervised by the *Commission de Surveillance du Secteur Financier*—8A, rue Albert Borschette, L-1246 Luxembourg. Tel: +352-46 66 67-1 Fax: +352-46 66 76. **Poland:** Issued by Templeton Asset Management (Poland) TFI S.A.; Rondo ONZ 1; 00-124 Warsaw. **South Africa:** Issued by Franklin Templeton Investments SA (PTY) Ltd, which is an authorized Financial Services Provider. Tel: +27 (21) 831 7400 Fax: +27 (21) 831 7422. **Switzerland:** Issued by Franklin Templeton Switzerland Ltd, Stockerstrasse 38, CH-8002 Zurich. **United Arab Emirates:** Issued by Franklin Templeton Investments (ME) Limited, authorized and regulated by the Dubai Financial Services Authority. **Dubai office:** Franklin Templeton, The Gate, East Wing, Level 2, Dubai International Financial Centre, P.O. Box 506613, Dubai, U.A.E. Tel: +9714-4284100 Fax: +9714-4284140. **UK:** Issued by Franklin Templeton Investment Management Limited (FTIML), registered office: Cannon Place, 78 Cannon Street, London EC4N 6HL. Tel: +44 (0)20 7073 8500. Authorized and regulated in the United Kingdom by the Financial Conduct Authority.

Australia: Issued by Franklin Templeton Australia Limited (ABN 76 004 835 849) (Australian Financial Services License Holder No. 240827), Level 47, 120 Collins Street, Melbourne, Victoria 3000.

Hong Kong: Issued by Franklin Templeton Investments (Asia) Limited, 17/F, Chater House, 8 Connaught Road Central, Hong Kong. **Japan:** Issued by Franklin Templeton Japan Co., Ltd., Shin-Marunouchi Building, 1-5-1 Marunouchi Chiyoda-ku, Tokyo 100-6536, registered in Japan as a Financial Instruments Business Operator [Registered No. The Director of Kanto Local Finance Bureau (Financial Instruments Business Operator), No. 417]. **Korea:** Issued by Franklin Templeton Investment Advisors Korea Co., Ltd. 3rd fl., CCMM Building, 101 Yeouigongwon-ro, Yeongdeungpo-gu, Seoul Korea 07241. **Malaysia:** Issued by Franklin Templeton Asset Management (Malaysia) Sdn. Bhd. & Franklin Templeton GSC Asset Management Sdn. Bhd. This document has not been reviewed by Securities Commission Malaysia. **Singapore:** Issued by Templeton Asset Management Ltd. Registration No. (UEN) 199205211E, 7 Temasek Boulevard, #38-03 Suntec Tower One, 038987, Singapore.

Please visit www.franklinresources.com to be directed to your local Franklin Templeton website.

The views and opinions expressed are not necessarily those of the broker/dealer; or any affiliates. Nothing discussed or suggested should be construed as permission to supersede or circumvent any broker/dealer policies, procedures, rules, and guidelines.

