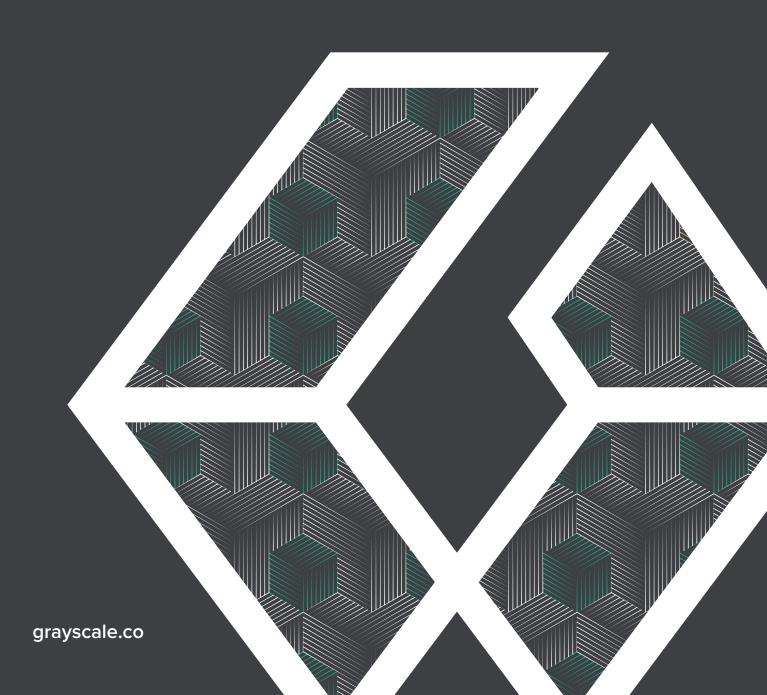


An Introduction to XRP





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An Introduction to XRP

XRP is the native digital currency supported by RippleNet, the underlying peer-to-peer (P2P) payment network that allows for near instantaneous transactions across the world. Together, XRP and RippleNet were designed to address liquidity challenges faced by financial institutions using traditional payment channels (i.e., SWIFT, ACH, FedWire system). By providing the means for fast, secure, and low-cost conversions between varying units of value (e.g., commodities, fiat currencies, and other digital assets), the network has the potential to capture significant value from a global payments market worth an estimated \$2 trillion USD.¹ It was first conceptualized in 2004 by Ryan Fugger, and after several iterations, the Ripple network was formally launched in August 2013, led by the founders² of the eponymous, private company known today as Ripple.

By design, XRP is unlike many of its digital currency counterparts. Instead of a supporting blockchain protocol, it uses the XRP Ledger to validate transactions by requiring network participants to reach consensus. In addition, the development and maintenance of the technology is overseen by Ripple, which is funded through their own reserves of XRP and by private investments from influential investors, including Andressen Horowitz, Google Ventures, Digital Currency Group and Pantera Capital.³ Ripple technology is also integrated with a unique subset of products (e.g., xCurrent, xRapid, xVia, xPring) targeted specifically for financial institutions. These factors have propelled XRP's increasing adoption as a global payment rail and helped to establish XRP as the third largest digital asset in the ecosystem by market cap.⁴

4. As of October 31, 2019.





Kate Rooney. "Ripple wants a piece of the global payment system while it fights a cryptocurrency 'holy war." CNBC. January 8, 2019. https://www.cnbc.com/2019/01/07/ripple-wants-a-piece-of-the-global-payment-system.html.
The Ripple co-founders are Jed McCaleb, Chris Larsen, David Schwartz, and Arthur Britto.

^{3.} Digital Currency Group, Inc., the sole member and parent company of Grayscale Investments, LLC, owns a minority interest in Ripple, which retains a central role in stewarding the development of the XRP Ledger.

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FIGURE 1: XRP SUMMARY STATISTICS5 As of October 31, 2019

Asset ⁶	XRP
Network	RippleNet
Protocol	XRP Ledger
Inception of Network	August 2013
Price (USD)	\$0.30
Market Cap (USD)	\$12.82 billion
Circulating Supply (XRP / % of Max Supply)	43.25 billion / 43.25%
Max Supply (XRP)	100 billion
Average Transaction Time	5 seconds
Sector	Global Payments

A Brief History of XRP

The Ripple Project emerged in 2004 in the form of RipplePay, a decentralized P2P payments platform intended to replace financial intermediaries. It was created by Ryan Fugger, who hypothesized that Ripple, the digital currency native to the platform that has since been renamed to XRP, would be preferred to regular money for its ease of use and cost efficiency.⁷ Early on, it failed to gain mainstream acceptance and growth was stagnant for years after its formation.

In 2011, Jed McCaleb began to devise a similar payments system and over the following year, was joined by David Schwartz, Arthur Britto, and Chris Larsen. In 2012, they approached Fugger and took over the Ripple Project with the

6. Frequently used terms: XRP is the digital currency and asset native to Ripple technology. RippleNet is the P2P network comprised of financial institutions that serve as transaction validators. The XRP Ledger is the open-source protocol powered by RippleNet where users can send or receive payments in XRP.

7. "Why Ripple?" A Ripple Communications Company. https://classic.ripplepay.com/essay/.



^{5.} Coin Metrics, CoinMarketCap.com, Messari / OnChainEX, As of October 31, 2019.

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intent of addressing fundamental issues with incumbent financial institutions and other digital assets at the time. Inspired by earlier works on distributed consensus networks, the team invented the original Ripple protocol (RTXP) and with the help of Noah Youngs, the <u>Ripple Protocol Consensus Algorithm</u> (RPCA),⁸ to create a system that would process transactions more quickly and securely.

In September 2012, the team went on to found a privately-owned organization called OpenCoin. Prior to this, a fixed amount of 100 billion XRP was created and allocated amongst the founders in an unknown distribution. The founders agreed that no more XRP would be produced and recognized that the technology would need capital to accelerate development, and consequently, granted 80 billion XRP to the organization in a collective effort, while also using seed funding raised from initial investors.

Today, the company overseeing the development of RippleNet is known as Ripple. It is headquartered in San Francisco and was named one of Fortune's 2019 best places to work in Silicon Valley.⁹ Ripple raised \$55 million USD in its Series B funding round in September 2016.¹⁰ RippleNet is now comprised of over 200 financial institutions (e.g., banks, payment providers, brokers, unions) that serve as independent users and transaction validators.¹¹ Led by Brad Garlinghouse, the current Ripple CEO, the company is equipped with an experienced team of developers and the financial resources to expand the capabilities of XRP and its accompanying Ripple technology.

Defining Characteristics of XRP

The developers of XRP and the Ripple network designed a protocol to challenge existing financial systems and alternative digital currencies. XRP sought to eliminate high transaction fees and long processing times driven by institutions, and like most digital assets, addresses the double-spending problem, which is when third parties are needed to monitor counterfeited money or forged transactions.¹² Developers integrated features including a consensus algorithm and escrow schedule in lieu of a blockchain protocol and mining rewards, as well as incorporated a suite of commercial financial products. In doing so, XRP has gained momentum amongst both financial institutions and individual users.



^{8.} David Schwartz, Noah Youngs, and Arthur Britto. The Ripple Protocol Consensus Algorithm. https://ripple.com/files/ripple_consensus_whitepaper.pdf.

^{9. &}quot;Best Workplaces in the Bay Area" 2019." Great Place to Work. <u>https://www.greatplacetowork.com/best-workplaces/bay-area/2019?category=small-and-medium-companies</u>.

^{10. &}quot;Ripple - Investors." Crunchbase. <u>https://www.crunchbase.com/organization/ripple-labs/investors/investors_list#section-investors.</u> 11. <u>https://www.ripple.com/ripplenet/</u>. October 31, 2019.

^{12.} David Schwartz. "Ripple and XRP - Part 7: Consensus vs. Proof-of-Work (2018)." YouTube. March 9, 2018. https://www.youtube.com/watch?v=RZqsUaDBgTY.

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XRP Ledger

The <u>XRP Ledger</u>, short for XRP Ledger Consensus Protocol, is an open-source, distributed ledger that uses cryptography to hold, transfer, and trade assets.¹³ A distributed ledger uses a decentralized network, RippleNet in this context, to validate transactions in a process called consensus. The network nodes independently update their version of the ledger and come together to vote on the correct order of transactions. Once a majority of the nodes agree, a new ledger is created and adopted as the correct version.¹⁴

This consensus algorithm differs from the proof-of-work (PoW) or proofof-stake (PoS) blockchain protocols used in most other digital currency networks.¹⁵ A PoW or PoS network is built so that participants are competing over rewards for uploading a transaction on to the blockchain. Conversely, in a consensus network, competition amongst participants does not exist, as the primary incentive for honest transaction validation is based on trust and the vested interests of participants in the network.

Absence of Mining Rewards

At inception, 100 billion XRP was created by the founders of Ripple and fixed to be the maximum supply cap, 80 billion of which was allocated in the form of a grant to create what is known today as Ripple. The intuition behind this was to prevent arbitrary creations of money, potentially leading to hyperinflation or manipulation. Instead of mining rewards, the company utilizes an escrow mechanism to control the distribution of XRP supply. According to Ripple, 50 billion XRP is currently being held in escrow.¹⁶

In escrow means that XRP is held in reserve until a contractual or time obligation is completed. According to the company, a maximum of 1 billion XRP will be unlocked on a monthly basis by selling to institutional investors or on exchanges.¹⁷ The remainder from the 1 billion limit that is not sold is added to the end of the queue and the estimated time to release all XRP from escrow increases.¹⁸

It is important to note that several reports from independent data providers have surfaced that discuss some discrepancies with how XRP supply is disseminated. For more, please refer to this May 2019 report by CoinMetrics.



^{13.} Brad Chase and Ethan MacBrough. Analysis of the XRP Ledger Consensus Protocol. Ripple Research. February 21, 2018. https://arxiv.org/pdf/1802.07242.pdf.

Shaan Ray. "The Difference Between Blockchains & Distributed Ledger Technology." Medium: Towards Data Science.
February 19, 2018. https://towardsdatascience.com/the-difference-between-blockchains-distributed-ledger-technology-42715a0fa92.
Proof-of-work (PoW) is a blockchain protocol in which miners compete to upload blocks on to the blockchain and receive mining rewards for their efforts. Proof-of-stake (PoS) is a blockchain protocol in which validators approve of transactions and receive a transaction fee for their efforts. Source: Ameer Rosic. "Proof of Work vs Proof of Stake: Basic Mining Guide." Blockgeeks. 2017. https://blockgeeks.com/guides/proof-of-work-vs-proof-of-stake/.

^{16.} Ripple. https://data.ripple.com/v2/network/xrp_distribution?descending=true&limit=3. October 31, 2019.

^{17.} Ari Levy. "Ripple is sitting on close to \$80 billion and could cash out hundreds of millions per month - but it isn't." CNBC. January 16, 2018. https://www.cnbc.com/2018/01/16/why-ripple-is-not-cashing-out-its-xrp-holdings.html.

Brad Garlinghouse. "Ripple to Place 55 Billion XRP in Escrow to Ensure Certainty of Total XRP Supply." *Ripple*. May 16, 2017. https://www.ripple.com/insights/ripple-to-place-55-billion-xrp-in-escrow-to-ensure-certainty-into-total-xrp-supply/.





Commercial Product Suite

There are four financial products geared towards Ripple's target customer base -- institutions:

- 1. **xCurrent** is an enterprise software designed to integrate with existing banking infrastructure to allow for fast, global payments. It is backed by the Interledger Protocol (ILP), which enables payments to be sent and received across different digital currency networks, rather than the XRP Ledger, which only enables XRP transactions.
- 2. **xRapid** facilitates the trading of XRP on xCurrent. This allows for near instantaneous liquidity at minimal costs, as long as XRP is amply available on exchanges. It is intended for emerging markets where fiat currency liquidity may be inaccessible and transaction costs are often high.
- **3. xVia** is a payment interface combining the xCurrent and xRapid services and is used with an API. It allows for payments to be sent, but not received, with the option to attach important transaction information, like messages or invoices.
- **4. xPring** is the initiative to invest in and potentially acquire projects started by entrepreneurs that utilize XRP and Ripple technology. Its objective is to increase XRP usage, broaden the infrastructure supporting the XRP ecosystem, and raise awareness on the different use cases of Ripple technology.

For more information, please refer to the product pages for <u>xCurrent</u>, <u>xRapid</u>, <u>xVia</u>, and <u>xPring</u>.

In addition, XRP and RippleNet possess the following qualities that make it a unique digital asset network:

- Level of Decentralization: The degree of decentralization for a given network is determined relative to the entire digital currency ecosystem. XRP and RippleNet are relatively less decentralized because of (i) Ripple's involvement as one of the driving forces of adoption, (ii) the amount of XRP supply in possession of the founders and the company, and (iii) the high concentration of XRP in the top 100 wallets.¹⁹
- Semi-permissioned: Ripple decides which financial institutions become a part of RippleNet through its authorship of the RippleNet Rulebook, the legal framework delineating every transaction conducted using XRP and / or Ripple technology.



^{19. &}quot;XRP Stats by @WietseWind." https://ledger.exposed/rich-stats. As of October 31, 2019.





The network also maintains a Unique Node List (UNL) to verify validating servers that comply with the RippleNet Rulebook.²⁰ This differs from most networks using a blockchain protocol, where any entity with the financial and computational resources can become a node.

- Secure: RippleNet consists of users and validators in a system where each validator determines which other validators to trust for an accurate version of the latest XRP Ledger. Since validators are identified and selected by other validators based on trust, it is more difficult for new, unknown validators to carry out a malicious attack on the network. In more than six years, the XRP Ledger has never been successfully attacked to reverse or alter its transaction history.²¹
- **Open-source**: The source code for the XRP Ledger is available on the Internet, free for anyone to access, contribute to, or fork. The XRP Ledger will continue to exist independent of Ripple, the organization. This is an important characteristic for building trust and accumulating users.

In contrast, the technology backing Ripple's commercial products are proprietary and not necessarily available to the public.

- **Transparent**: All transactions are recorded and publicly viewable on the XRP Ledger from anywhere in the world.
- **Pseudo-anonymous**: Public wallet addresses are not directly linked to any identifying personal information. However, in the current state, complete anonymity is difficult to achieve. This is because addresses involved in any XRP transaction are permanently and publicly viewable on the XRP Ledger.²²
- Finite supply: At inception, 100 billion XRP was created for the Ripple network. As mentioned, there are no mining rewards and instead, XRP held in the company's account is released from escrow on a monthly basis. An established and transparent monetary supply and issuance schedule is critical for evaluating a digital currency's investability.
- **Deflationary supply**: For every transaction, a minimum commission fee of 10 drops (.00001 XRP) is destroyed.²³ Transaction costs are clearly outlined by the XRP Ledger Project. This fee deters malicious entities from overloading the network by making it costly to spam the network and carry out an attack. Moreover, a minimum balance of 20 XRP is required to be held in each wallet address from the time of creation.



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 [&]quot;Validators and Unique Node Lists." XRP Ledger. <u>https://xrpl.org/technical-faq.html</u>.
David Schwartz. "The XRP Ledger: Fostering Industry Performance and Innovation." Ripple. September 24, 2019. https://www.ripple.com/insights/the-xrp-ledger-fostering-industry-performance-and-innovation/. 22. Aaron Van Wirdum. "Is Bitcoin Anonymous? A Complete Beginner's Guide." *Bitcoin Magazine*. November 18, 2015. <u>https://bitcoinmagazine.com/articles/is-bitcoin-anonymous-a-complete-beginner-s-guide-1447875283</u>, 23. "Transaction Costs." XRP Ledger. <u>https://xrpl.org/transaction-cost.html</u>.





Potential Advantages of XRP

The design of XRP and the Ripple protocol leads to four potential advantages when compared to traditional financial institutions, payment channels, and other digital asset networks:

- 1. Fast transaction speeds: XRP transactions are completed at an average rate of 5 seconds. It is among the quickest settlement rails relative to the top ten digital assets by market cap, along with Stellar Lumens (XLM) and Eos (EOS).²⁴ It is much faster than the time it takes to process international or domestic transactions sent via traditional payment channels, which is often several days.
- 2. Low transaction fees: The average XRP transaction cost is \$0.0002. It is the among the lowest relative to the top ten digital assets by market cap, along with Stellar Lumens (XLM) and Eos (EOS).²⁵ It is far cheaper than the international or domestic wire transfer fees charged for each transaction by banks.
- **3.** Institutional payment network: RippleNet is made up of over 200 major financial companies, including American Express, Santander, and MoneyGram, and continues to add new customers every week. This trend reflects that established firms perceive value in a fast, scalable, low-cost payment system. The Ripple-backed network provides an extra layer of accountability and reassurance for large-scale institutional clients.
- 4. On-demand liquidity: xRapid provides the means for fast liquidity between financial institutions using XRP. For example, for an illiquid currency pair with little-to-no trading volume, like the Venezuelan bolívar and the Indian rupee, XRP can act as an intermediary currency pair so that the value of the transaction can be received in the local currency on either side of the transaction. This is also applicable to other digital currencies, in combination with fiat currencies.

As a result of these advantages, XRP and the Ripple protocol may be better suited for financial institutions than existing payment channels that take days to process, have limited transfer windows and have high international fees. Additionally, it has characteristics unique to its protocol that differentiate it from other major players in the digital currency landscape. Given the network's ability to process transactions faster, cheaper, and in a more liquid fashion than many of the previously mentioned alternatives, it may be a better fit for financial institutions and other business enterprises looking to incorporate this technology into their services.

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^{24.} CoinMetrics. As of October 31, 2019.

^{25.} See previous footnote.





Potential Disadvantages of XRP

Level of Decentralization

XRP appears to be relatively less decentralized when compared to other digital assets. Determinants of decentralization include, but are not limited to, (i) the presence of a central authority and its role in the network, (ii) susceptibility to market manipulation, and (iii) concentration of the digital asset in a small number of wallets.

(i) Development of the technology is overseen by a Ripple, a company that is privately owned and operated. It holds approximately 56.7 billion XRP, including 6.7 billion for investment and strategic purposes and 50 billion in escrow.²⁶ It is also important to note that approximately 21% of the validator nodes in the network are controlled by Ripple.²⁷

(ii) Ripple has rules outlining the organization and founders' ability to sell their XRP supply, as a safeguard against supply shocks.

(iii) The concentration of XRP in the top 100 wallets is higher relative to other top digital assets, corresponding to 75% of non-escrowed XRP and 37.5% of all existing XRP.²⁸

Potential for Supply Shocks

The majority of XRP supply is still held by the Ripple protocol founders and the company. Though there are selling restrictions placed on both, there is a risk that large and/or sustained periodic sales could place pressure on the price of XRP.

Regulatory Uncertainty

The SEC has stated that certain digital assets may be considered "securities" under the federal securities laws. To date, the SEC has only identified two digital assets, Bitcoin and Ethereum, for which it does not intend to take the position that they are securities. As a result, any other digital asset, including XRP, is at risk of being deemed a security, which may have material adverse consequences for such digital asset.

26. See footnote 16



 [&]quot;Mini Validator List I XRP Ledger Validating Nodes." <u>https://minivalist.cinn.app/</u>. As of October 31, 2019.
"XRP Stats by @WietseWind." <u>https://ledger.exposed/rich-stats</u>. As of October 31, 2019.





Summary

XRP and the underlying Ripple technology stack serve as a fast, inexpensive, and secure way to make payments across the world. Equipped with a suite of financial products that support its utility, XRP also has the potential to provide fast liquidity solutions for institutions. It has several advantages compared to other digital assets for specific use cases due to key differences in the design, development, and maintenance of its protocol. For the foreseeable future, Ripple, the company, has the capital and resources needed to oversee the continued development of the XRP ecosystem. As it continues to add clients to RippleNet and fund university research initiatives related to blockchains and payment technology²⁹, it will be important to understand how their efforts translate into network growth and new investment required to support XRP's viability as a sustainable investment opportunity.

To learn more about other digital assets underpinning the Grayscale family of products, please visit the Building Blocks section of <u>Grayscale Insights</u>.

29. https://www.coindesk.com/ripple-teams-with-10-new-universities-for-blockchain-research-initiative



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