

the Modern History of Payments Networks

**Insights on how our society decided
to move money and how it's changing**

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Abstract



We are in the midst of a payments technology renaissance. For decades, legacy systems like ACH and SWIFT have served as the primary rails for financial transactions in the Western world. In recent years, however, new networks have emerged to address the limitations of these aging infrastructures — frameworks that are rife with fraud, are slow, and extract value from businesses and users.

Stablecoins are a relatively new phenomenon. With the first stablecoin issued on a blockchain in 2014, only within the last few years have we seen the beginnings of their mass adoption. They offer us a new orchestration layer across legacy money movement networks which are primed to change the way our society transacts.

This paper explores the evolution of U.S. payment systems, examines the technologies that power them, and compares their features to highlight opportunities for innovation.

The Problem with Payments

Humans have been figuring out how to transact with one another more efficiently since the beginning of time. From barter based economies in ancient times, to the usage of precious metals as money, to the development of centralized financial institutions to broker global commerce, the systems that we have used to transmit value have been simplistic.

Fiat money took over from gold, checks surpassed fiat, and with the development of the internet digital check based technology emerged.

However, our financial system is rife with inefficiencies even still. Banks have a monopoly on managing capital in our society. The technology they use moves money slowly, which causes liquidity costs, chargeback risk, credit risk, fraud, and costly transactions.

For decades, legacy frameworks like the ACH Clearinghouse and SWIFT have been the primary rails for payments in the U.S. But that's changing fast. New networks have been developed and launched in recent years to attempt to address the shortfalls of legacy payments and move value at the speed at which money truly moves.

In this paper, we will review the history of U.S. payment systems, the underlying technologies and compare their features, to better understand the shortcomings of these historic systems.

In parallel to the traditional financial system upgrading their technologies, a separate system of blockchain based payments has emerged to solve some of the same issues with legacy payments technology, but with a radically different technological approach.

History of Payments

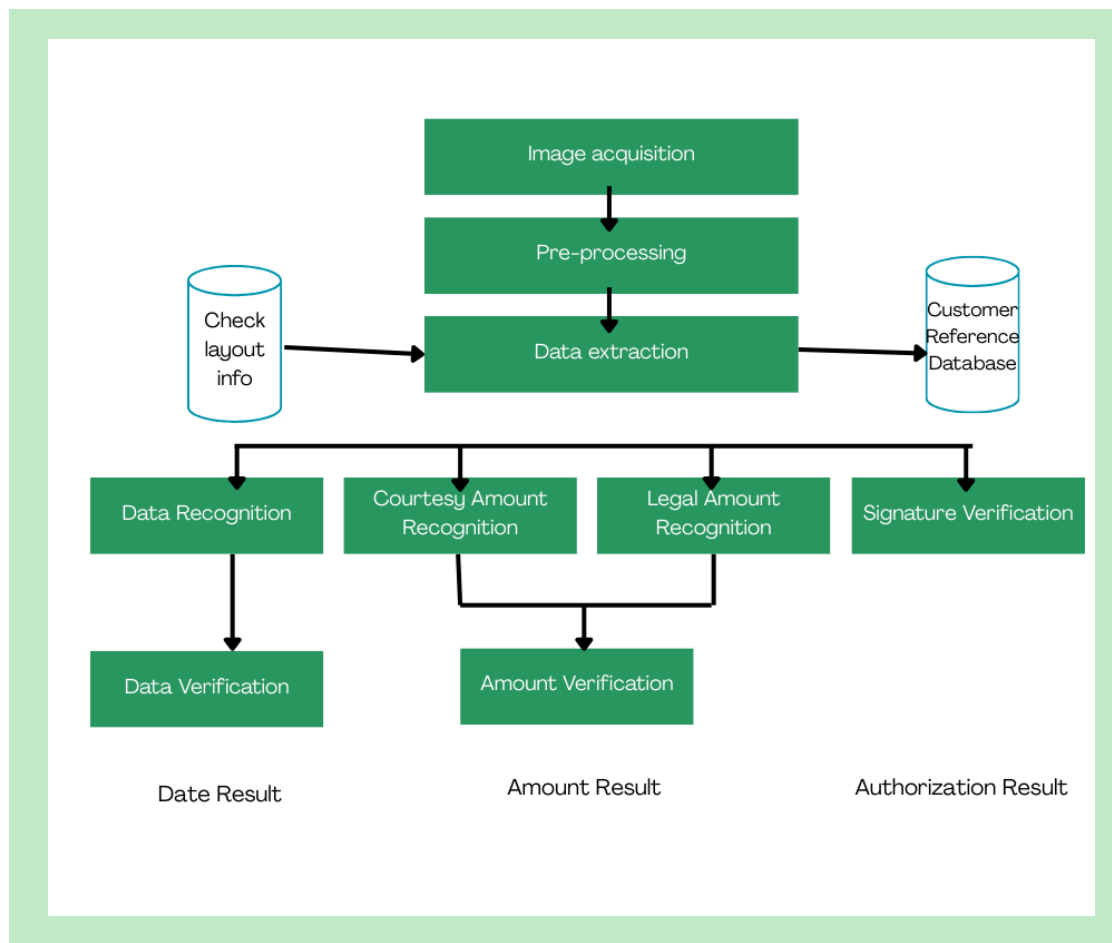
Systems Beyond Checks:

ACH & SWIFT

ACH (Automated Clearing House)

Before ACH, checks were the primary tool for moving cash. As an increase in access to the financial system occurred with newfound post WWII wealth, as well as the proliferation of corporations, the processing of paper checks became too operationally cumbersome for banks in the U.S. to handle at scale.

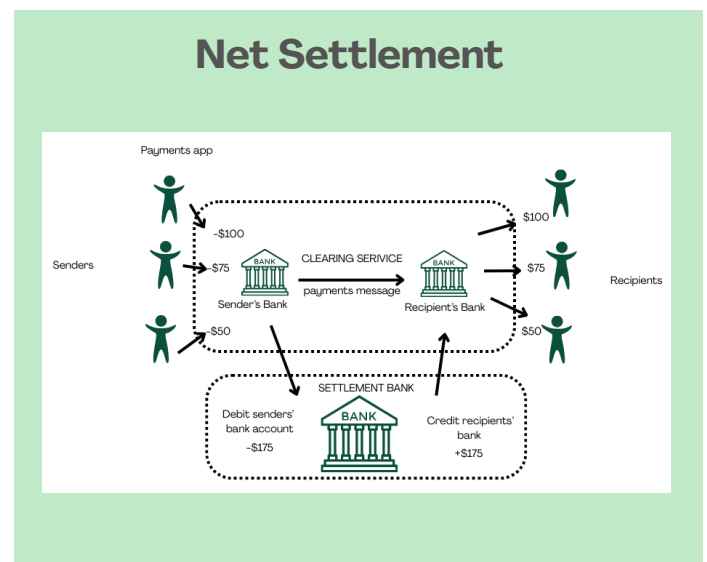
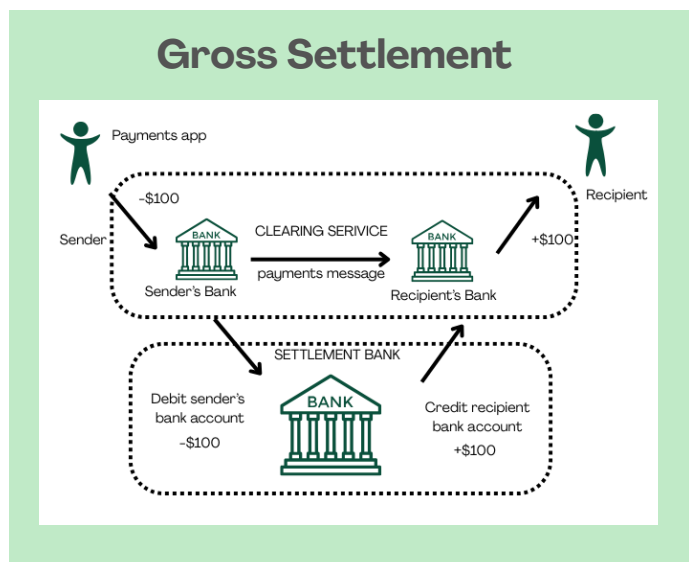
Below, we can see the process required by each bank to simply gross settle one individual check.



This diagram demonstrates just the data validation process required at a single bank. This multi-step process, in addition to the communication between banks that then ensues, increases the amount of float, or temporary periods where money exists in multiple places, within the economy since nothing could be done with those funds while they were stuck in transit for days on end.

In the 1960s, a coalition of banks from core financial centers came together to build an interbank network in order to speed up money movement processing and reduce the level of friction and fragmentation described above. In 1972, the first formalized Automated Clearing House (ACH) association was created by a cabal of banks in California.

In 1974, the National Automated Clearing House Association (NACHA) was created to create consistent interoperability rules across regional ACH networks. One of the key innovations of ACH payments was the ability to net settle payments - meaning that banks would settle transaction balances with each other at the end of the day on a cash basis rather than each any every transaction individually.



In the 1980s, government agencies began using the ACH Clearinghouse for processing payments, while the Federal Reserve introduced its own ACH service, which increased the network's capacity. In a significant expansion of services, the Social Security Administration adopted ACH to facilitate direct deposit payments. This is likely one of the largest technical upgrades by a government institution in the pre-internet era.

In the 1990s, payroll processors moved en masse from issuing paper checks to offering direct deposit. Electronic bill pay software also emerged to support business-to-business payments.

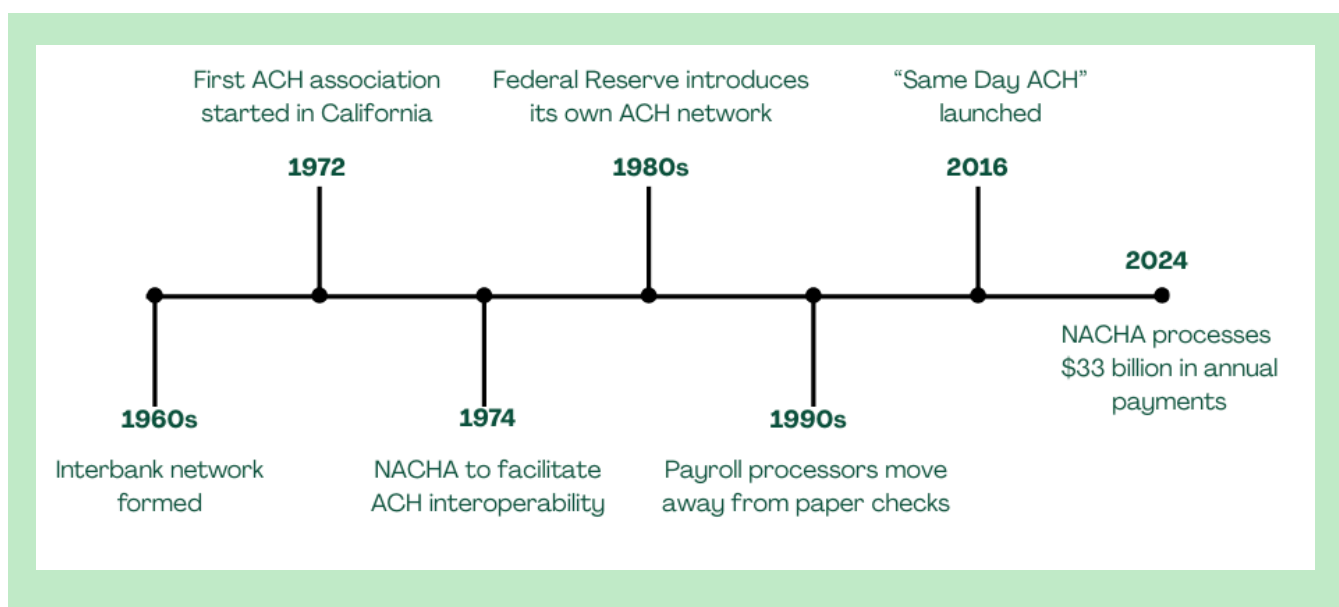
In 2016, “Same Day ACH” was launched, allowing for 3 batch processing windows per day. Payment processors were required to pre-fund accounts to ensure sufficient balances were available before payments were made. Some credit models also emerged for companies that could not pre-fund accounts. One of the most popular uses of credit-financed Same Day ACH is Earned Wage Access (EWA) companies like DailyPay and Payactiv.

2021 saw an expansion of Same Day ACH by allowing for larger transaction limits. NACHA reported over \$33 billion in total ACH Network payments in 2024.¹

Under the Hood of ACH

How it Works

- Mechanism: Batches domestic credit and debit entries through Originating Depository Financial Institution (ODFI)/ Receiving Depository Financial Institutions (RDFIs) via two operators—Federal Reserve and The Clearing House.²
- Timing: 1-3 business days³
- Value Extraction: Per-transaction ACH fees, value-dated batching, and low-cost alternative to checks/wires.
- Scale: ~33.6 billion transactions worth \$86.2 trillion in 2024.⁴



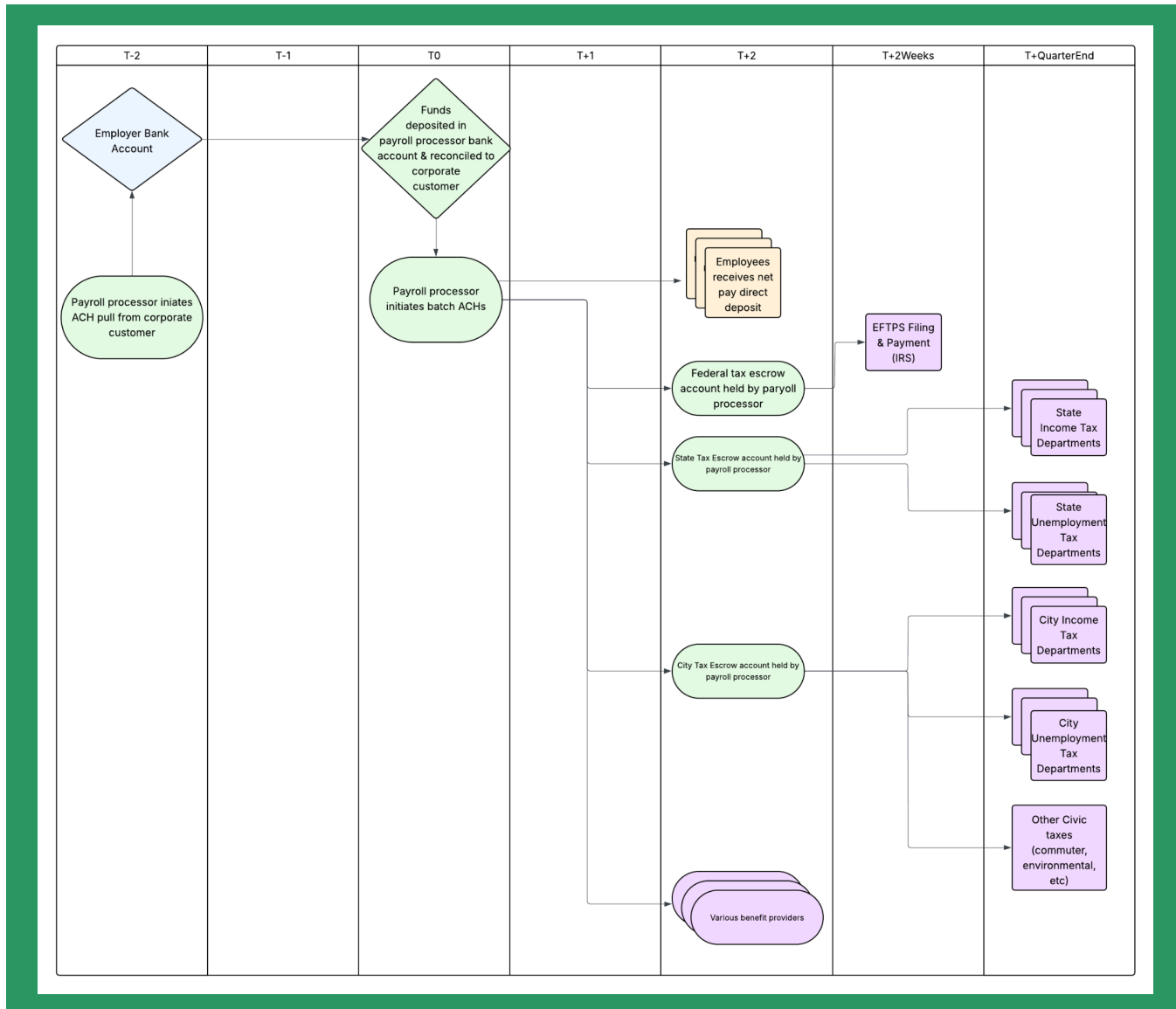
1 <https://www.nacha.org/content/ach-network-volume-and-value-statistics>

2 <https://www.moderntreasury.com/learn/odfi-vs-rdfi>

3 <https://ramp.com/blog/how-long-do-ach-transfers-take>

4 <https://www.nacha.org/content/ach-payments-fact-sheet>

ACH Sample Use Case: Payroll Processing



SWIFT (Society for Worldwide Interbank Financial Telecommunication)

SWIFT is a network that was established in 1973, around the same time as NACHA, to facilitate international monetary movement messaging. SWIFT was launched in Brussels across 15 countries with 239 participating banks, a standard messaging protocol for international interbank transfers. The first official SWIFT message was sent in 1977. By the end of the 1980s, there were thousands of banks participating in the network.

Before SWIFT, financial transactions were largely conducted on Telex machines, a technology that was slow, inefficient, and prone to errors. It was essentially a fax machine for money, which relied on the manual interpretation of messages, making it excessively risky.

Note: SWIFT does not actually facilitate money movement; it is only a messaging protocol. When a bank receives a SWIFT message, it then initiates a debit or credit via its internal processes. Often, banks maintain “Vostro” or “Nostro” accounts, which are accounts at international banks in the local currency to facilitate transfers.

In the 1990s, SWIFT introduced a more modern messaging platform based on IP addresses as well as new formats for messaging types.

In 2001, SWIFTNet was launched as a response to the dot-com boom and to facilitate high-throughput, low-latency transaction data. During this time, SWIFT also created more standardization in compliance standards for payments and further formalized international payments data structures. During the 2008 financial crisis, SWIFT collaborated with central banks around the world to improve system risk monitoring.

In 2020, SWIFT overhauled its message formats to something slightly more modern and more widely recognizable - XML-based messaging. As of the writing of this paper in 2025, the transition to the XML standard is still in progress.

SWIFT is a fairly bare bones communication method for international banks that is slow, expensive, and ultimately doesn't move money from A to B.

Cybersecurity Challenges: The 2016 Bangladesh Bank Heist

SWIFT has also been the subject of large security failures. In 2016, 35 fraudulent instructions were issued by hackers via SWIFT to illegally transfer nearly \$1 billion from the central bank of Bangladesh's Federal Reserve Bank of New York Account to Bangladesh Bank.



Early Telex machine, courtesy of Wikipedia

This event exposed weaknesses around the messaging protocol. SWIFT responded with the Customer Security Programme (CSP), requiring members to adhere to mandatory security controls.

SWIFT has also been a political tool. Governing bodies, like the United States and European Union, implement sanctions, like in 2012 when it cut off Iranian banks from the network due to development of its nuclear program, as well as the prohibition of interacting with Russian banks by most of the Western world after the Russian invasion of Ukraine.

SWIFT Use Case: International Remittances

While Western Union has created its own network to move money around, it does leverage SWIFT messaging protocol for international payments. This helps

Western Union create transparency between counterparties, and because it uses this standard messaging protocol the payments can be completed faster by the correspondent banks.

Under the Hood of SWIFT

How it Works

- Mechanism: Messaging network for international payments. Banks send structured payment instructions; actual settlement goes via correspondent banking, central bank RTGS, or CHIPS.
- Timing: Settlement typically ranges from 1 to 4 business days. However, several factors can influence the actual duration, including the initiation time, processing time, and settlement time (subject to initiating bank's processing time).
- Value Extraction: Subscription and messaging fees; banks charge wire transfer fees (\$25–50 per transaction).⁵
- Scale: Average of 53 million financial messages per day⁶

⁵ <https://www.moderntreasury.com/journal/how-do-interbank-settlement-networks-work>

⁶ <https://www.swift.com/about-us/who-we-are#:~:text=Our%20story-,Swift%20in%20numbers,sent%20every%20day%20on%20average>

RTP & FedNow: Instant Payments in the United States

In 2013, the Federal Reserve published a paper, “Payment System Improvement - Public Consultation Paper”, which called for faster payments capabilities.⁷ This study led to the creation of the The Faster Payments Task Force in 2015, which consisted of key stakeholders across the financial system. The Real Time Payments network (RTP) emerged as a private solution, while FedNow was launched by the Federal Reserve as a public solution later on.

RTP (Real-Time Payments)

The Clearing House (TCH) was first incorporated in 1853 by some of the largest commercial banks in the U.S. like Bank of America and JP Morgan Chase. It spearheaded the development of RTP, which was officially launched in 2017. The first RTP was made between US Bank and BNY Mellon. Smaller banks joined the network largely through middleware software providers, namely banking-as-a-service providers (FIS, Fiserv) or from other sponsor banks.

Direct vs Indirect Participation

- Direct participants are financial institutions that connect directly to the RTP network and have a Federal Reserve master account. These banks fund and settle transactions in real time.
- Indirect participants access RTP through a third-party sponsor bank or a core processor that acts as a gateway.

RTP is limited, however, in that it only supports push payments - meaning a payer sends money from their account to the recipient's account. Not yet supported are pull payments, or payments where the recipient initiates a debit from the payer's account. This is how many subscription based payments are made and how payroll systems generally work. RTP does, however, have a Request for Payment (RfP) feature which is a notification to the payer to initiate a push transaction. Another key characteristic of RTP is that payments are final and irreversible.

⁷ https://fedpaymentsimprovement.org/wp-content/uploads/2013/09/Payment_System_Improvement-Public_Consultation_Paper.pdf

Limits of RTP

Upon launch of the network, individual transactions were limited to \$1 million each. In February 2025, the maximum transaction amount was capped at \$10 million. For companies that are connected into the RTP network from third parties, there may be arbitrary limits implemented by the services provider or additional fees on top of the ones charged by the network. This system is not available to retail users, it's primarily focused on commercial use cases.

Sample Use Case: Invoice Factoring

Shipping and freight companies commonly use invoice factoring in order to gain faster access to their revenue in order to finance purchases

down their supply chains. QuickPay Factoring, a financial services provider to these types of companies, recently implemented RTP as a way for their business customers to access factored capital outside of normal business banking hours.¹⁰

FedNow

Separately from the development of RTP, FedNow was announced by the Federal Reserve as an initiative in 2019. It is a Real-Time Gross Settlement (RTGS) service for instant payments and attempts to address some of the flaws of RTP - namely providing equitable access to the network from smaller financial institutions, and in the future address payment types RTP does not.

Under the Hood of RTP

How it Works

- Mechanism: Managed by The Clearing House; operates 24/7, using a pre-funded joint account.
- Timing: Instantaneous per-transaction settlement
- Value Extraction: Fees are a few cents per transaction; targets commercial clients. There is a \$0.045 Credit Transfer fee paid on a per transaction basis to be paid by the sender. To access the RfP feature it costs \$0.01 paid by the requester.⁸
- Scale: Q2 2025 reported 107 million transactions of ~\$481 billion in volume⁹

8 <https://www.alloy.com/blog/real-time-payments-rtp-vs-fednow?>

9 <https://www.theclearinghouse.org/payment-systems/rtp/institution#:~:text=The%20RTP%20network%20has%20over,Participation%20Rules%20for%20additional%20information.>

10 <https://www.theclearinghouse.org/payment-systems/rtp/rtp-use-cases/Use-Cases/Freight-Factoring>

After years of development and a pilot program, FedNow launched on July 20, 2023, with a limited group of early adopters including JPMorgan and Wells Fargo. Unlike SWIFT, it is both a messaging and payments network. So far, its primary function has been to improve how depository institutions interact with the Fed and each other. Its stated goal is to ripple out to retail and business end users to transact with each other directly on the network.

While its per transaction fees are the same as RTP, FedNow charges for things like reporting, cash management, and other fees. It can be quite costly for a bank to participate in FedNow.

There is also an extensive technical onboarding process for banks to join. A swath of middleware providers have emerged in order to smooth out the onboarding process for institutions and also provide some technology the network does not have.

Banks also need to maintain sufficient liquidity buffers in their master accounts at the Fed to ensure they have funds to continue settling transactions. They are also required to settle their master account balances directly at the Fed, even outside of normal business hours.

Comparing RTP vs. FedNow

The Real Time Payments network and FedNow are quite similar when comparing their availability, settlement times, messaging standard, and goals. They both emerged around the same times in recent history in order to solve the same problems. The biggest differences are that they are governed by different bodies, and are in varying stages of going-to-market.

These systems both revolve around centralized pools of capital and have so far largely been tools for large financial institutions to streamline transactions among themselves. The upside of these systems have not yet been felt by every day participants of our financial system. And when the technology does eventually ripple down to individuals to transact with one another, their money will continue to go through layers of financial

middlemen who extract value along the path of money movement. It will just be faster than it is now.

Where RTP and FedNow Fail

Despite ongoing significant improvements to payment infrastructure in recent decades, chronic inefficiencies in settlement and funds reconciliation remain a plague to the global financial systems. In periods of high market stress, a hard truth has become clear — the system hasn't proven that it can support rising levels of financial activity and the speed in which money needs to move. Interbank settlement delays costs can exceed 10× normal levels during these periods of high activity, resulting in tens of billions of dollars in global cost spikes, while liquidity fragmentation and outdated processing models continue to extract value from users and financial institutions.

RTP and FedNow are technical improvements to the slow moving ACH and SWIFT alternatives, but they retain fundamental flaws that are inherent with our centralized banking infrastructure.

At their core, they still rely on the middleman model that slows down money movement, fragments liquidity, and introduces unnecessary costs to businesses.

In attempting to modernize antiquated payments rails, they are simply giving the same old horse a shinier saddle. And this has created the opportunity for an entirely new settlement model: stablecoins.

The Stablecoin Opportunity: A New Foundation for Settlement

Stablecoins, a type of cryptocurrency that lives on a blockchain which is pegged to a fiat currency, introduce a new path forward for financial settlements — one that removes the need and delays of many of the historic financial intermediaries outlined in this report. While many indicate its potential as a complete replacement for the payments technologies discussed above, it is currently more of an orchestration layer that sits on

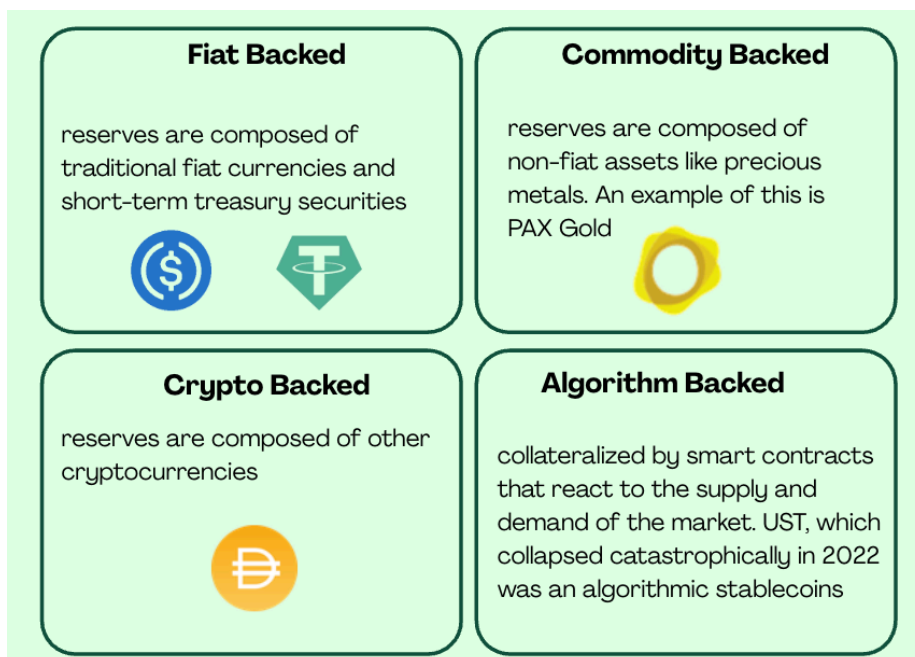
top of those technologies — coordinating and routing payments across underlying infrastructure.

Stablecoin Technology & Types of Stablecoins

When the Ethereum blockchain was launched in 2015, it had a new technological paradigm called “smart contracts.” A smart contract is essentially a series of automatically executing “IF/THEN” statements built into a program that lives on a blockchain. The qualities that make smart contracts innovative are that they are trustless (rules governed by code versus people), automate transaction execution, have visible terms, and are auditable in a public record.¹¹

Also in 2015, Ethereum core developer Fabian Vogelsteller proposed the ERC-20 standard. This was a set of technological criteria by which a “token” or a store of value could be issued on a blockchain. The technological criteria include things like total token supply, function calls for transferring tokens, and metadata.¹² These tokens are also interoperable with smart contracts.

These two innovations helped to lay the foundation for the proliferation of stablecoins.



¹¹ <https://ethereum.org/smart-contracts/>

¹² <https://www.gemini.com/cryptopedia/erc20-token-standard-ethereum>

History of Stablecoins

Stablecoins, as of the writing of this report, have been almost entirely issued by private companies.

Stablecoins date back to 2014, or five years after the genesis of the Bitcoin blockchain. Unlike the



payment systems previously detailed in this report, stablecoins offer \$0 chargeback risk, instant, fully funded gross settlement, and the costs of using are related to blockchain network fees which have been decreasing by orders of magnitude since their inception. They sit on top of these legacy payments networks offering a new, more efficient layer of orchestration for money movement.

The first issuer of a widely used stablecoin was done by Tether, which issues USDT. It initially launched on Bitcoin's Omni Layer, which brought the first large-scale USD-pegged token to market. Its early use cases centered around crypto trading, allowing traders to take positions off without needing to fully liquidate their holdings.

Also in 2014, a company called MakerDAO began work on DAI, which launched in 2017 using the ERC-20 standard on Ethereum. DAI was unique because it was entirely collateralized by other ERC-20 tokens. Users would issue stablecoins by putting other tokens into a "vault" or a smart contract designed by the MakerDAO team. The smart contract would then spit out DAI that was overcollateralized by the value of the tokens in the vault. If the value of the vault fell below a certain threshold, say 110% of the value of the DAI stablecoins issued, the vault would automatically sell the collateral tokens to maintain the 1:1 price of DAI to USD.

The proliferation of regulated fiat-backed stablecoins began in 2018. The most popular stablecoin used in the United States is USDC, issued by Circle, a company that went public in 2025. With the maturation of blockchain technology and the decreasing costs of using blockchains, we are witnessing an explosion of stablecoin activity across the globe. In 2025, the

US Congress also passed the GENIUS Act, which was the first piece of legislation that codified the disclosure, audit and regulatory standards that stablecoin issues should follow.

Revisiting International Remittances

Stablecoins are starting to surpass the world's largest payment processes. In 2023, \$7.2 trillion was settled onchain in stablecoins, surpassing Visa's annual transaction volume for the first time.¹³

The earliest demonstrable example of product market fit for stablecoins was that of international remittances. With relatively cheap transaction fees, and continued dominance of the U.S. Dollar globally, stablecoins offer a simple, cost effective, and instant way to do business around the world. Emerging markets lead in retail stablecoin usage — over 50% of property transactions (Argentina) and 50% of all crypto transactions (Turkey) involve a USD stablecoin.¹⁴

Stablecoin Adoption Quick Facts

- 244.06 billion in circulating stablecoin supply of mid-2025
- 60% of all decentralized financial (DeFi) transactions are denominated in stablecoins
- USDC alone processed \$5.4 trillion in 2023

Programmability & Use in Smart Contracts

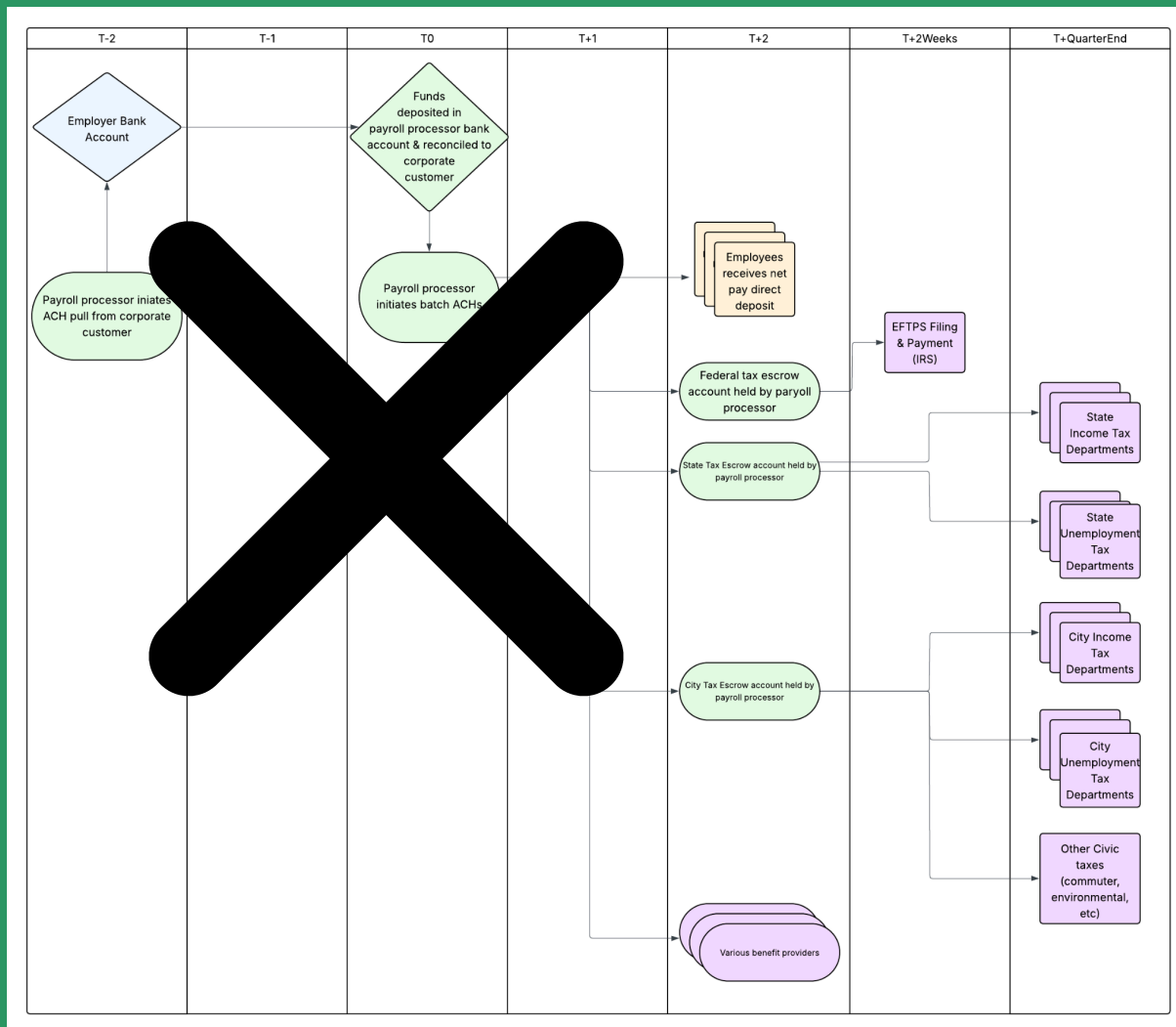
As stablecoin adoption has increased, so has the opportunity for smarter payments technology. Because stablecoins can interact with smart contracts, the ability to program automatically executing transactions in a way like never before.

One elegant example of this is payroll processing. Rather than a traditional payroll processor initiating hundreds of ACH transactions, undertaking massive treasury reconciliation operations, and multi-day or -week settlement of funds, payroll smart contracts can be deployed to execute payroll payments within seconds.

¹³ <https://www.theblock.co/data/stablecoins/usd-pegged>

¹⁴ <https://medium.com/opentrade/what-argentina-nigeria-and-turkey-are-really-telling-us-about-the-future-of-money-8a2a250e133c>

Revisiting Payroll Processing



Stablecoins can compress the fairly lengthy settlement time of traditional payroll cycles because of its instant movement and cost effectiveness. Furthermore, because stablecoins are programmable money via smart contracts, many of the manual steps currently required in initiating, reconciling, and reporting payroll runs can be automated.

Across the Franklin platform, in just the first eight months of 2025, we have seen a 303% increase in the use of stablecoins integrated into the use of payroll operations. This has resulted in more than half of Franklin users being able to run same day payroll cycles.

Conclusion

Stablecoins outperform legacy and modern payment rails across every key dimension—settlement speed, cost, liquidity efficiency, access, and programmability—offering a globally accessible, always-on alternative for the digital economy. However, they do not exist in a silo totally disconnected from more traditional payments technologies, but in fact sit on top of them and optimize money further.

While once revolutionary as a digital alternative to relying on paper money (and the post) to execute payments, legacy frameworks like ACH and SWIFT, much like their physical predecessors, are no longer capable of supporting the speed at which money moves.

Similar to how sails gave way to steam amidst the industrial revolution; paper and wire systems have no place in the programmable future of money.

Stablecoins chart a new path forward for commerce, value, and the future of payments. Through introducing programmability to payments, these revolutionary digital dollars overcome the core bottlenecks of traditional payment systems—**settlement delays, liquidity traps, geographic limits, high fees, and lack of programmability**—by running on **decentralized, global, and programmable infrastructure** that can be customized the specific business' needs.

For the increasingly digitally-native global generation, stablecoins support payments that are faster, more dependable, and protect against the growing threats of inflation and failed payments that can cripple economies and wallets — as well as back offices.

These features are not theoretical — they're rooted in real adoption.

As compliance, scalability, and enterprise adoption improve, stablecoins are poised to **displace, replace or integrate beneath legacy systems** as the foundational settlement layer for programmable money.