

The Anatomy of a Stablecoin Card Swipe

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Inspired by Ahmed Siddiqui's The Anatomy of the Swipe

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Card networks are a marvel of human coordination.

Every second, they process over 25,000 transactions around the world.

Each year, they move over \$30 trillion across 800 billion payments.

With a tap or a swipe, you can buy just about anything at 175M+ merchant locations. In person or online.

But while making a card purchase feels instant to you, the systems that actually move money from your account to the merchant are not so simple. They rely on pre-internet financial plumbing that imposes real costs on the companies behind your card. Costs that compound when money needs to cross borders.

While hard for the average person to see, these costs have restricted everyone but the deepest-pocketed companies from offering card services. Even for them, whole populations remain unprofitable to serve.

Here, we'll explain how card networks work, identify their strengths and where they're showing their age. Then we'll explain how stablecoin cards preserve those strengths, while upgrading antiquated financial plumbing for the modern era.

By the end, you'll understand why stablecoins underlie more and more of the world's \$30 trillion in card payments each year.

Authorization: the 2-second miracle

To buy your \$5 morning coffee, you tap your card and within two seconds the transaction is approved and you're on your way.

Unbeknownst to you, that tap sets off a series of messages. From the card reader, to the coffee shop's bank, through the card network, to your card issuer. This process confirms that you can afford the coffee, and that the purchase doesn't look like fraud. An approval then races back along the same path. All in two seconds.

This is where the marvel of the system lies. It lets two strangers, represented by two different institutions, transact in an instant, and then move the money later, according to a set of rules neither of you ever had to think about.

It works billions of times a day, the same in Boston or Bogotá, and everywhere in between.

Interchange: the cost of miracles

To accept your payment, the coffee shop hands over a cut of your \$5. In the US, usually around 2-3%.

That 2-3% is split among three different companies. The card network (Visa, Mastercard, etc.) keeps a small sliver. Another sliver goes to the payment processor that the merchant uses to accept the card (Square, Toast, etc.). Then the rest goes to the company that issued the card.

The fee that goes to your card issuer is called **interchange**.

Interchange is the engine that makes the entire system work. Without it, no business would take on the risk and costs associated with issuing your card. It also funds the rewards you likely enjoy, as many card issuers pass a portion of these fees back to you, in the form of cash back, airline miles, and more.

These fees are the cost of using this complex system that magically authorizes billions of transactions a day. 24/7.

But this two-second approval is only the first part of the story. Moving the actual money takes two steps: clearing, then settlement.

Clearing: the great compression

When your coffee purchase was approved, your card issuer sent a message telling your coffee shop you were good for it. Along with an agreement to send the money later.

No money actually moved.

The first step is called **clearing**. At the end of the day, the coffee shop's bank bundles your transaction with every other, and submits the list to the card network.

The network takes that list, along with lists from the banks of millions of other merchants, and nets everything out into an even simpler list. One that shows what each bank owes, and what each bank is owed.

Clearing is another marvel of the system. It compresses billions of daily transactions into a short list of IOUs between banks.

However, the next step, where the money actually moves, is where the system is starting to show its age.

Settlement: pre-internet financial plumbing

Settlement is the vast behind-the-scenes machinery that shuffles money from your card issuer to the coffee shop's bank. Plus about \$80 billion more from every other purchase that day.

Money moves not one coffee at a time, but in massive, netted batches. Banks that owe pay the card network. Then the network pays the banks that are owed. This is effectively when your coffee shop gets paid.

On a debit card, it comes straight out of your account. On a credit card, your card issuer fronts it, and collects from you at a later date.

The system works well enough. You've long finished your coffee by this point, and the coffee shop gets paid eventually.

The challenge sits with the company behind your card. It has to make sure it always has enough money on hand when these settlement batches come due. For your coffee purchase, and for the purchases of every other customer it serves.

And it has to do so through systems built in a pre-internet world.

These systems produce lags, which is where the first big problem appears.

Prefunding: the cost of waiting

Settlement runs on bank time.

In the US, most settlement moves through two systems: ACH and Fedwire. One built in the 1970s, the other with roots in 1918. Neither runs on nights, weekends or holidays.

So if you bought your coffee Friday at 5:30pm, the money won't move to the merchant until Monday morning. Tuesday if it's a long holiday weekend. And this lag is where the system's first hidden tax shows up. Not for you or the coffee shop, but for your card issuer.

Your issuer has to be ready to pay for your \$5 coffee, and every other transaction from that weekend. Let's say its customers spend \$1M a day, and Monday is a holiday. It'll need \$4M sitting in an account by Friday night waiting to move Tuesday morning.

That idle money waiting for settlement is called prefunding. It's money the card issuer could be using for working capital, or reinvesting in its business. Instead it just sits there, waiting for pre-internet financial plumbing to kick in during banking hours.

Now imagine your card issuer needs to settle \$10M or \$100M a day. Then it becomes \$40M or \$400M in idle capital.

There's no fundamental reason it needs to work like this, other than the fact that these settlement systems are heavily entrenched. It's why, historically, card programs could only be run by banks with pockets deep enough to leave that kind of money sitting idle. And it leaves less room for smaller, more nimble issuers.

Cross-border: where the pipes end

Up until now, we've focused on a single US domestic transaction.

One country, one currency, one holiday calendar.

Now imagine you live in Colombia, spending pesos on a card issued locally. You can buy your coffee in Bogotá with the same two-second approval, and your card issuer runs into the same prefunding expense.

What if you buy a Claude subscription online from Anthropic (a US company)? For you, nothing changes. You tap and pay in pesos. But for a cross-border transaction like this, the network must be paid in dollars. Your card issuer now owes a currency it doesn't hold.

US dollar settlement systems (ACH and Fedwire) are only available to US banks. So your card issuer has to do what nearly everyone outside the US does. It opens an account at a bank in New York, converts pesos to dollars, and prefunds it. That bank then settles US dollar transactions on its behalf.

Opening that account takes months of compliance reviews. Funding it takes an FX trade, which takes a spread. And the instructions to move the money travel over SWIFT, a bank messaging network founded in 1973.

This daisy-chain of banks holding money for other banks is called the correspondent banking system.

And it means your card issuer now runs prefunding twice. One pot of idle pesos in Bogotá. One pot of idle dollars in New York. Two holiday calendars to manage.

If your card issuer wants to serve users in Mexico, Argentina, and Europe, it gets more complicated. Each new market means another local bank willing to hold its money, more FX spreads to pay, and more idle capital to lock up. Three more pots, five in all, scattered around the world.

Serving a global audience takes even deeper pockets and a ton of patience. For businesses born on the internet, whose users show up from everywhere on day one, it's a structural mismatch. Global companies are forced into geographic borders.

Enter stablecoins

Stablecoins emerged in 2014, originally as a way to trade in and out of cryptocurrencies like Bitcoin.

They move over blockchains, which are essentially a new kind of database that runs 24/7, 365. Stablecoin issuers back these digital dollars with liquid assets, mostly US Treasuries. As long as each one can be redeemed for a dollar in the banking system, they hold their value at \$1.

Stablecoins soon grew popular in emerging markets. Especially among people who wanted the stability of dollars but couldn't get dollar bank accounts.

While having clear advantages over traditional dollars, mainly that they move 24/7 at little cost to anyone with an internet connection, they weren't ready for mainstream adoption. They were technically complex to use, and nearly impossible for merchants to accept.

Enter stablecoin cards

The first stablecoin cards appeared in 2019. They let you spend stablecoins anywhere cards were accepted. But the card issuer simply sold your stablecoins for ordinary dollars and settled with the card networks the old-fashioned way.

The companies behind the card still had to prefund ordinary dollars in a bank account, settle on bank time, through every pre-internet pipe described above. Same as before.

None of the settlement bottlenecks were addressed. They just bolted stablecoins onto the old system.

Enter stablecoin settlement

Then in 2021, Visa became the first major network to accept a stablecoin for settlement.

Visa began letting card issuers settle in USDC, a popular stablecoin, directly with the Visa network. And since blockchains aren't tethered to legacy banking hours, Visa eventually enabled settlement 365 days a year. Mastercard followed suit.

For merchants, nothing changed. They still got paid out by the card network in their local currency. But this back office upgrade changed the game for the companies behind your card.

Daily settlement eliminated the need to park millions to account for multi-day lags. A single pot of stablecoin collateral could now serve a global audience, breaking reliance on the correspondent banking system.

Serving the world no longer required a banking empire.

Anatomy of a stablecoin card swipe

Let's return to your original \$5 coffee purchase. Nothing about the experience changes for you or the coffee shop.

You tap your card or your phone. The same message races from the coffee shop's bank, through the card network, to the company behind your card. The only difference is what it's checking: that you have enough spending power onchain, rather than in a bank account.

The answer comes back along the same path. You're good for it, and it doesn't look like fraud. Two seconds, approved.

The coffee shop hands over its 2-3% fee, split the same three ways. Your rewards still get funded. At the end of the day, your purchase lands on the netted list alongside hundreds of millions of others. That list tells your card company exactly what it owes the network.

Everything from the tap through clearing runs exactly as it always has.

The difference comes when it's time for settlement. The multi-day prefunding pile-up vanishes. Instead, the company behind your card sends the network one lump daily payment in stablecoins, covering your coffee and everything else its customers bought that day.

It can make that payment any day of the year. On a Saturday. On Christmas morning. The network then pays out the merchant banks in regular currency. The same as it always has.

Prefunding, revisited

Recall your Friday evening coffee purchase heading into a holiday weekend. Your card program settling \$1M a day no longer has to park \$4M to wait for Fedwire and ACH to open Tuesday morning.

Friday's bill gets paid Friday. Saturday's gets paid Saturday. Most of that \$4M stays in the program's hands every weekend. More as it scales.

That money goes back to work, funding growth, product, and payroll. Every card program becomes more profitable to run. So more companies launch branded cards, and existing programs expand into markets that never made economic sense before.

The net result is access to more financial services for more people.

Cross-border, revisited

Fly back to Bogotá. Now your card is backed by digital dollars, rather than pesos.

Like many in Latin America, you're happy to save in US dollars. You can buy your local coffee, and your coffee shop can still get paid in pesos through the card network. And you can buy your Claude or ChatGPT subscription just the same.

The difference for the company behind your card is huge. It no longer needs separate idle pots of pesos and dollars sitting in Bogotá and New York. Every bill from the network is due in dollars, and your coffee and Claude subscription are paid from the same stablecoin balance.

This eliminates the need to set up a banking relationship in New York. No FX trade to fund it, no spread to pay. No SWIFT instructions to send.

Similarly, expansion to Mexico, Argentina, and Europe no longer requires a local bank to hold its money, or new holiday calendars to manage. Every new market settles daily from the same wallet. Five pots of idle capital become one.

For a card program, the correspondent banking system just became optional.

Anatomy of Rain

So far, we've walked through how the card networks work, and how stablecoin settlement upgrades the plumbing underneath them.

Rain is the company that pioneered this new breed of card. It provides a single platform for launching a stablecoin card, and for every stablecoin service around it. Rain holds principal memberships with Visa and Mastercard and settles directly with the networks in stablecoins, every day of the year. It was the first company in history to settle with Visa over a weekend and on Christmas.

Financial institutions, neobanks, and technology platforms use Rain to launch stablecoin card programs because they're cheaper and easier than traditional cards. The programs are also able to launch in multiple jurisdictions at once, with no correspondent bank accounts to open and no idle pots to fund.

From there, they can layer on rewards, embedded wallets, and 24/7 cross-border transfers.

Programs built on Rain carry the same compliance obligations as any traditional card program. This includes know-your-customer checks, fraud monitoring, and transaction monitoring.

Who's building on stablecoin cards

Companies big and small are launching stablecoin cards, creating new financial services that weren't viable before.

There's a new class of neobanks focused on narrow markets they know best, like the many teams across Latin America offering dollar accounts to users the banks never served. Internet marketplaces are putting cards in the hands of a global user base without dealing with a patchwork of correspondent banks.

Established institutions that could afford the old way of doing business are finding it cheaper to run on the new one. Like the world's largest remittance company, now sending stablecoins straight to the recipient's phone, spendable through an embedded Rain card the moment they land.

Stablecoin cards make up a small share of card payments today, but judging by who's building on them, that won't be true for long.

The invisible upgrade

You've likely never thought about the authorization, clearing, and settlement systems that transfer your \$5 to your coffee shop. Nor should you have to. The same is true with stablecoin cards. They just work, without the average person ever noticing anything has changed.

What people will notice is financial services becoming more abundant. That more companies are able to offer them. And that more institutions are serving people who were never profitable to serve before.

Stablecoin cards have rebuilt settlement from first principles. The rest of the card stack comes next. The messaging protocol behind each swipe still runs on a standard from 1987 and is due for an upgrade. Merchants will increasingly want to be paid out in stablecoins directly. And AI agents will transact with each other in stablecoins, using cards to touch the real economy.

Most importantly, stablecoin cards have made stablecoins compatible with the existing financial system. Famously, mobile phones first had to work with landlines before becoming the standard and producing innovations no one predicted. We expect stablecoins to do the same.

This is where the world is headed. The upgrade is already well underway.

Thanks & further reading

This piece borrows its title, with permission, from Ahmed Siddiqui's [The Anatomy of the Swipe](#), which explains how money moves when you tap a card. His sequel, [The Evolution of the Swipe](#), is out now.

For more on the gap between authorization and settlement, read Alex Johnson's [The Message and the Money](#).

Thanks to Farooq Malik, Charles Yoo-Naut, Lucas Piazza, Sean Clark, Casey Wagner, and Sophia Goldberg for informing and reviewing this piece. And to Hilda Wong for the great design work.