At the time of writing, BIP-77 is still being finalized, and payjoin adoption is relatively low. However the payjoin team has been hard at work on impressive new tools and docs. There's no time like the present to implement it and improve base layer tx!

Payjoin is an elegant solution for increasing scalability and preserving privacy. It saves block space (lower fees for all!) and weaken blockchain surveillance heuristics. Even those that don't use it benefit, but it's a team effort! The advantages are proportional to the level of adoption. Everyone stands to gain from widespread payjoin use.

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Satsie's Pocket Guide

to

PAYJOIN

A short zine about payjoin: what is is, why it's cool and how it works

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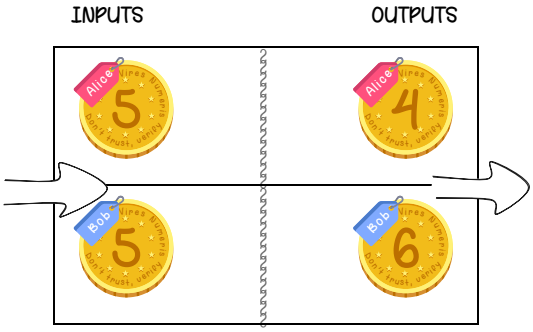
LAST UPDATED: JULY 2024

There are three payjoin BIPs

1. BIP-79: Bustapay (2018)
2. BIP-78: Payjoin (2019)
3. BIP-77: Payjoin V2 (2023)

BIP-77 makes using payjoin easier than ever. Previously, you had to run a secure server -- a high barrier to entry! Now, web clients are used to access untrusted, 3rd party **directory servers**. Directory servers support many users so individuals don't need to run their own. An Oblivious HTTP relay proxy server sits in front to protect user IPs. Participants can even work asynchronously (not being online at the same time) because the directory server buffers messages. BIP-77 also has authenticated encryption, allowing users to take advantage of this optimal architecture without compromising privacy or security.

With payjoin, the receiver also contributes an input. Let's say Bob already has 5 BTC in his wallet and he wants to use that in a payjoin tx. It would look like this:



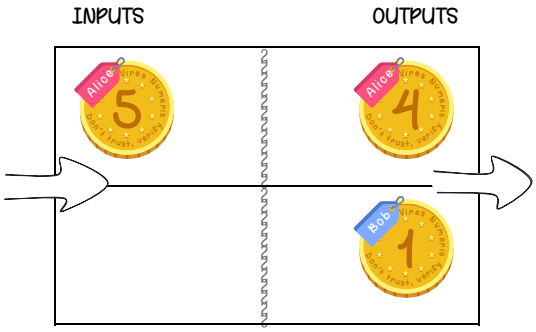
So why is this good? The first benefit is scalability. By definition, payjoin does some tx batching. In both scenarios, Bob ends up with a total of 6 BTC, but there's a slight difference in how it's represented. In the 1st example, he has 1 BTC from Alice and the 5 BTC he already had. With payjoin, he has a single 6 BTC.

Payjoin is a technique for batching ***bitcoin*** transactions while preserving privacy and blockspace.

Recall that:

1. ***bitcoin*** uses the UTXO model, and
2. coins (transaction inputs and outputs) can be of any value

Pretend Alice has 5 BTC in her wallet and she sends 1 BTC to Bob. The transaction (tx) looks like this:



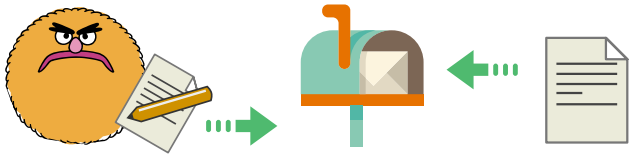
How BIP-77 works

Bob: I want to start using payjoin. Can I have a mailbox?

Directory Server: Sure! Here's your address

Bob: Hey Alice, anytime you want to send me BTC, use my mailbox so we can make a payjoin

Alice: Ok. I want to send you BTC. I've started a transaction, and am putting it in your mailbox. Add your input and it will be a payjoin.



Bob: Look! I have a payjoin transaction in my mailbox! Let me add my input and put it back in the mailbox

Alice: My turn to check the mailbox. The payjoin transaction is in there and it's complete. Now I can broadcast it to the network!

The way the 1 BTC from Alice was combined with Bob's existing 5 BTC is an example of **coin consolidation** More coins = more fees, so it's best to minimize the number of coins in your wallet. Instead of using one tx to transfer BTC, and another to consolidate coins, payjoin lets you do both at once, increasing tx throughput! That's not all. What if Bob wants to use the BTC from Alice to pay his friend Charlie? Or maybe he wants to open a Lightning channel? Using a tx for extra stuff like this is called a **tx cut-through**. By allowing additional inputs and outputs, payjoin lets you pack more activity into a tx. Alice was already going to send BTC to Bob. Payjoin is just a way to raise the tx throughput and save on fees that would have gone to creating additional txs. It's the simplest way to do transaction batching between two people.

☆ *Privacy* ☆

Blockchain surveillance uses heuristics to make assumptions about the nature of a tx, including how much BTC was transferred, how much the sender got back as change, and who owns which coins. The most common heuristic for tracking users is the assumption that all inputs belong to the sender.

Payjoin lets senders and receivers work together in a way that breaks one or more of these heuristics. After Alice and Bob used payjoin, the assumption that all inputs came from Alice is no longer true. The tx looks the same as if Alice provided multiple inputs.

In this regard, payjoin instantly brings privacy to on-chain transactions, right at the moment of payment.