



# Mempool & RBF - CPFP

## Dublin Bitcoiners Meet Up



# What is the mempool





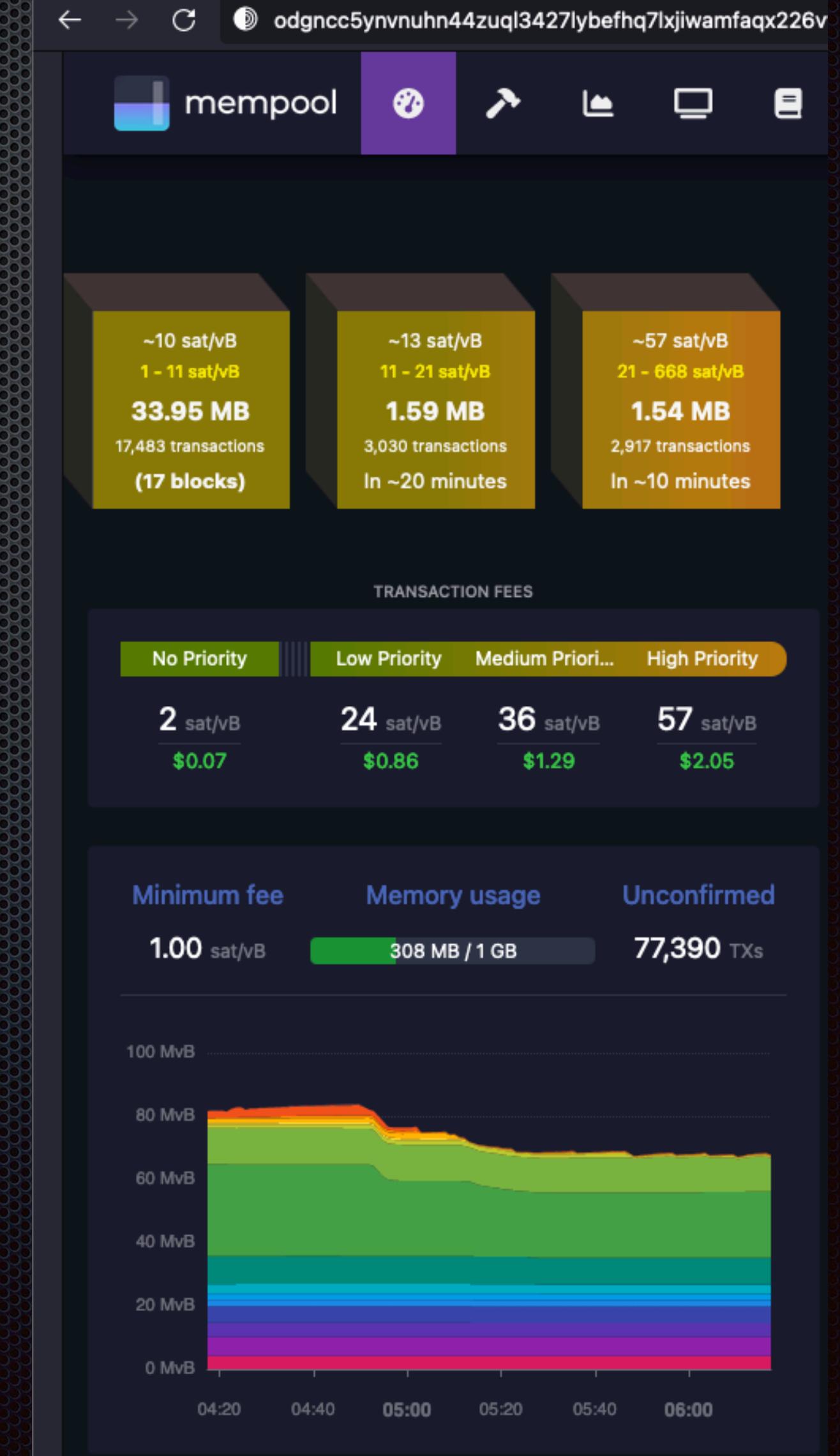
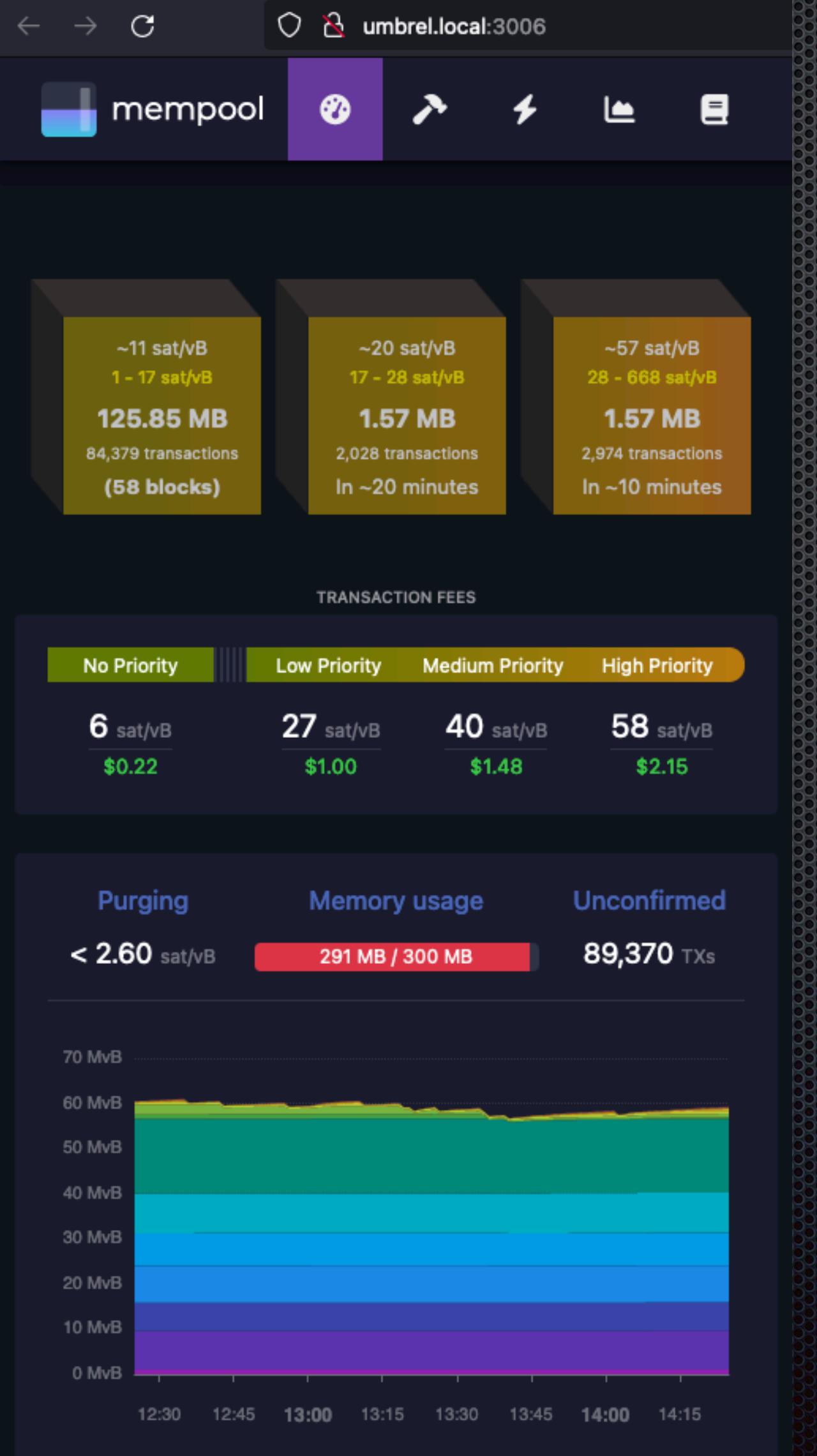
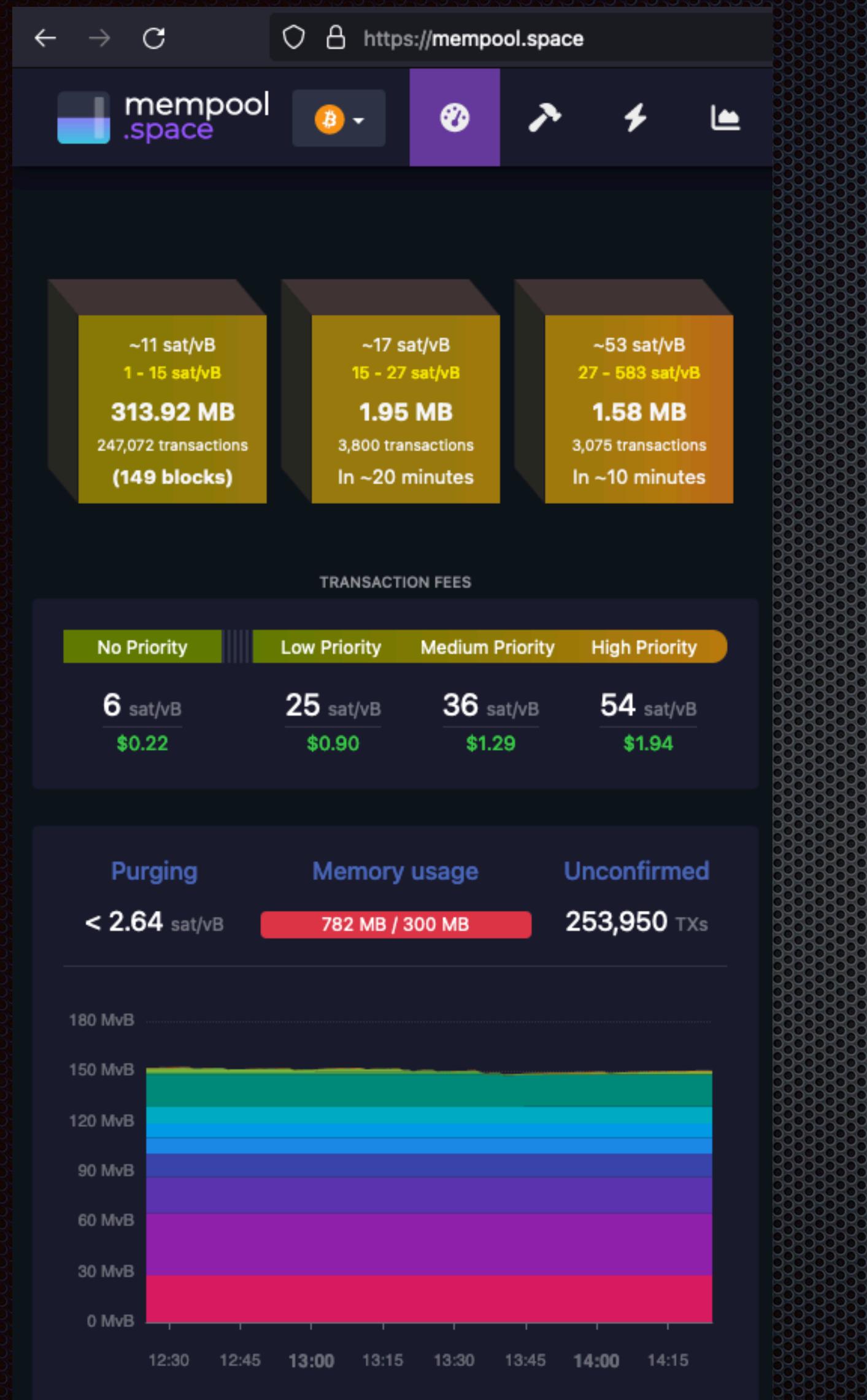
# Steps from the moment we broadcast a tx.

- The node contacts another node, and so we propagate the transaction
- So until it reaches a miner
- The miners place the tx based on the fees they are willing to pay. Miners are rational and want to maximize their efforts.\*
- There's an auction every 10 minutes for space.
- It is a dynamic market.



[XTX]

# Broadcast directly into the main mempools to avoid purging





[XTX]

The image displays two separate web-based interfaces for broadcasting Bitcoin transactions. Both interfaces feature a dark-themed header bar with various navigation icons and a search bar.

**mempool.space Header:**

- Logo: mempool.space
- Bitcoin icon with a dropdown menu
- Icons for blocks, transactions, lightning, and more
- Text: Explore the full Bitcoin ecosystem
- Search bar with a magnifying glass icon

**Broadcast Transaction Section:**

Transaction hex

**Blockstream Explorer Header:**

Blockstream Explorer

Bitcoin and Liquid network tabs

Dashboard, Blocks, Transactions navigation

Search bar: Search for block height, hash, transaction, or address

**Broadcast raw transaction (hex) Section:**

Broadcast transaction button



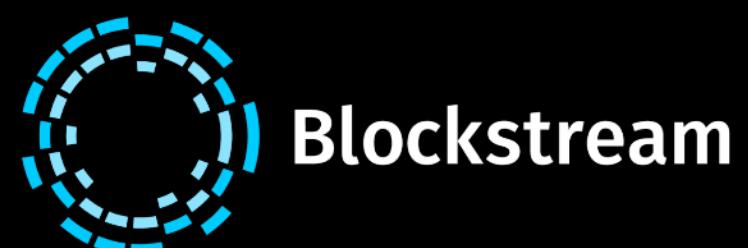
Select the perfect fee for your transaction and check the current status of the mempool.

mempoolhqx4isw62xs7abwphsq7ldayuidyx2v2oethhhj6mlo2r6ad.onion  
<https://mempool.space>



Get a transaction summary with fundamental technical and privacy analysis.

oxtblv4v7q5rotqtbbmtbcc5aa5vehr72eiebyamclfo3rc05zm3did.onion  
<https://light.oxt.me/>



Check the details of your transaction and basic privacy analysis.

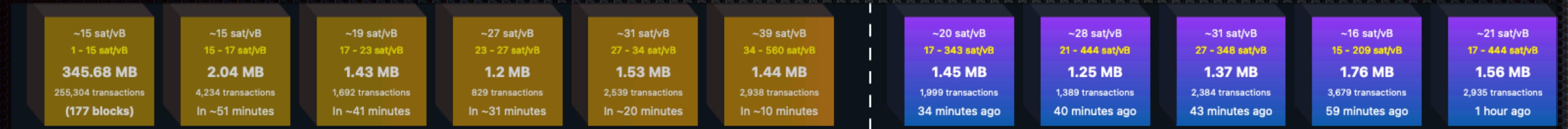
explorerzydxu5ecjrkwceayqybizmpjjznk5izmitf2modhcusuqlid.onion  
<https://blockstream.info/>



[XTX]



# mempool



## Transaction

5950c2bbf1adb1a5fbbc050d06918cdbb97d8e0855ec5cd24d57b61e076a2785

4 confirmations

Timestamp 2023-06-05 12:50 (59 minutes ago)

Fee 2,488 sat \$0.67

Features

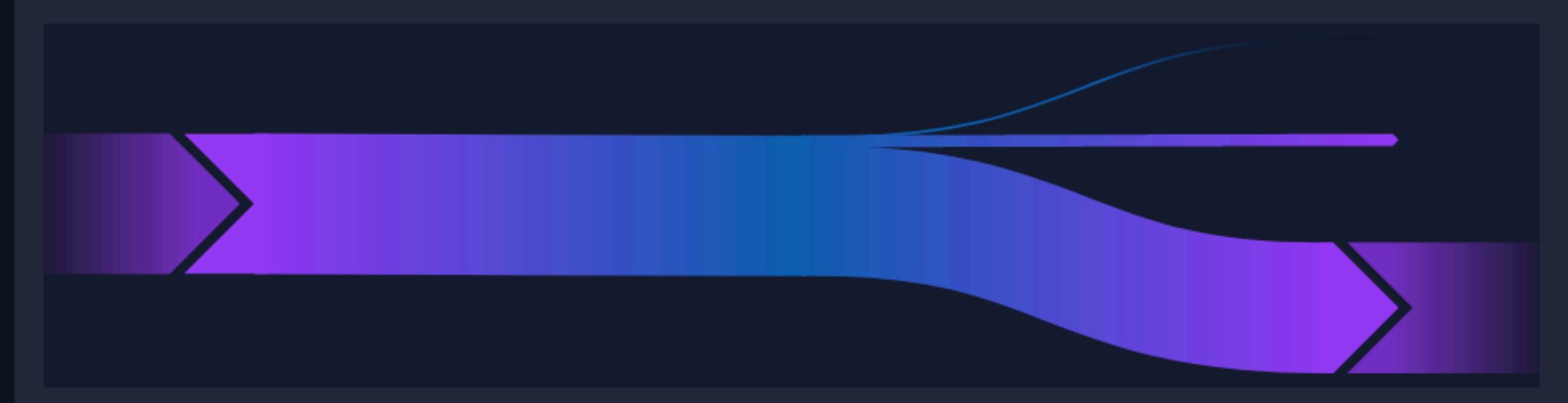
SegWit Taproot RBF

Fee rate

16.2 sat/vB Optimal

## Flow

[Hide diagram](#)



## Inputs & Outputs

[Details](#)

bc1ph9r00xh5s4mx3jnug77h86m... 8q5x5xa8

0.39865066 BTC

bc1palhrxuh38h5qm3cd35482tm... ss8afw5g

0.03000000 BTC

bc1ph9r00xh5s4mx3jnug77h86m... 8q5x5xa8

0.36862578 BTC

0.39862578 BTC



[XTX]

OXT

## TRANSACTION

segwit taproot

5950c2bbf1adb1a5fbcc050d06918cdbb97d8e0855ec5cd24d57b61e076a2785

MONDAY, JUNE 5, 2023 11:50 AM [BLOCK 792960]

SUMMARY INPUTS & OUTPUTS TECHNICAL NOTES (0)

### FINANCIAL

VOLUME	0.39862578 B	UTXOS CONSUMED
FEES	0.00002488 B	ADDRESSES
FEES/VBYTE	16.16 SAT/VB	
FEES/BYTE	12.14 SAT/B	
BDD	0.00 B.DAYS	

### INPUTS

1 UTXOS CREATED  
1 ADDRESSES

### OUTPUTS

### PRIVACY

2 NEW ADDRESSES  
2 PREVIOUSLY USED ADDRESSES  
1 TX ENTROPY  
50%  
0 BITS

## TRANSACTION

segwit taproot

5950c2bbf1adb1a5fbcc050d06918cdbb97d8e0855ec5cd24d57b61e076a2785

MONDAY, JUNE 5, 2023 11:50 AM [BLOCK 792960]

SUMMARY INPUTS & OUTPUTS TECHNICAL NOTES (0)

< bc1ph9r00xh5s4mx3jnug77h86m52j59g0879wm... -0.39865066 B  
p2tr key path reused address

bc1palhrxuh38h5qm3cd35482tmq4s7fs5f5xne... 0.03000000 B  
p2tr

bc1ph9r00xh5s4mx3jnug77h86m52j59g0879wm... 0.36862578 B >  
p2tr key path reused address change

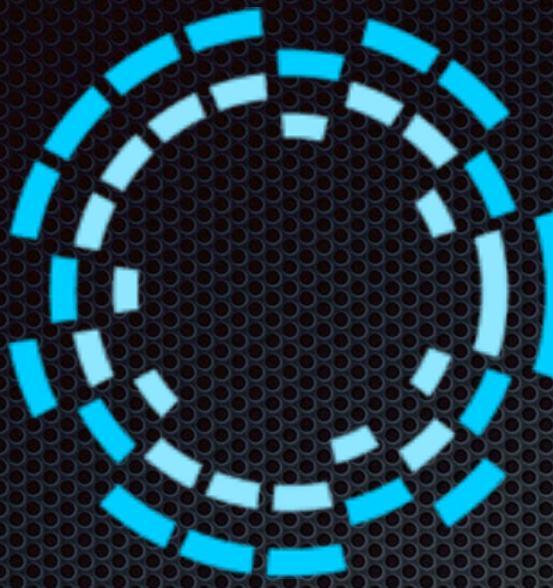
VOLUME OUT 0.39862578 B

FEES 0.00002488 B

TOTAL 0.39865066 B



[XTX]



Blockstream

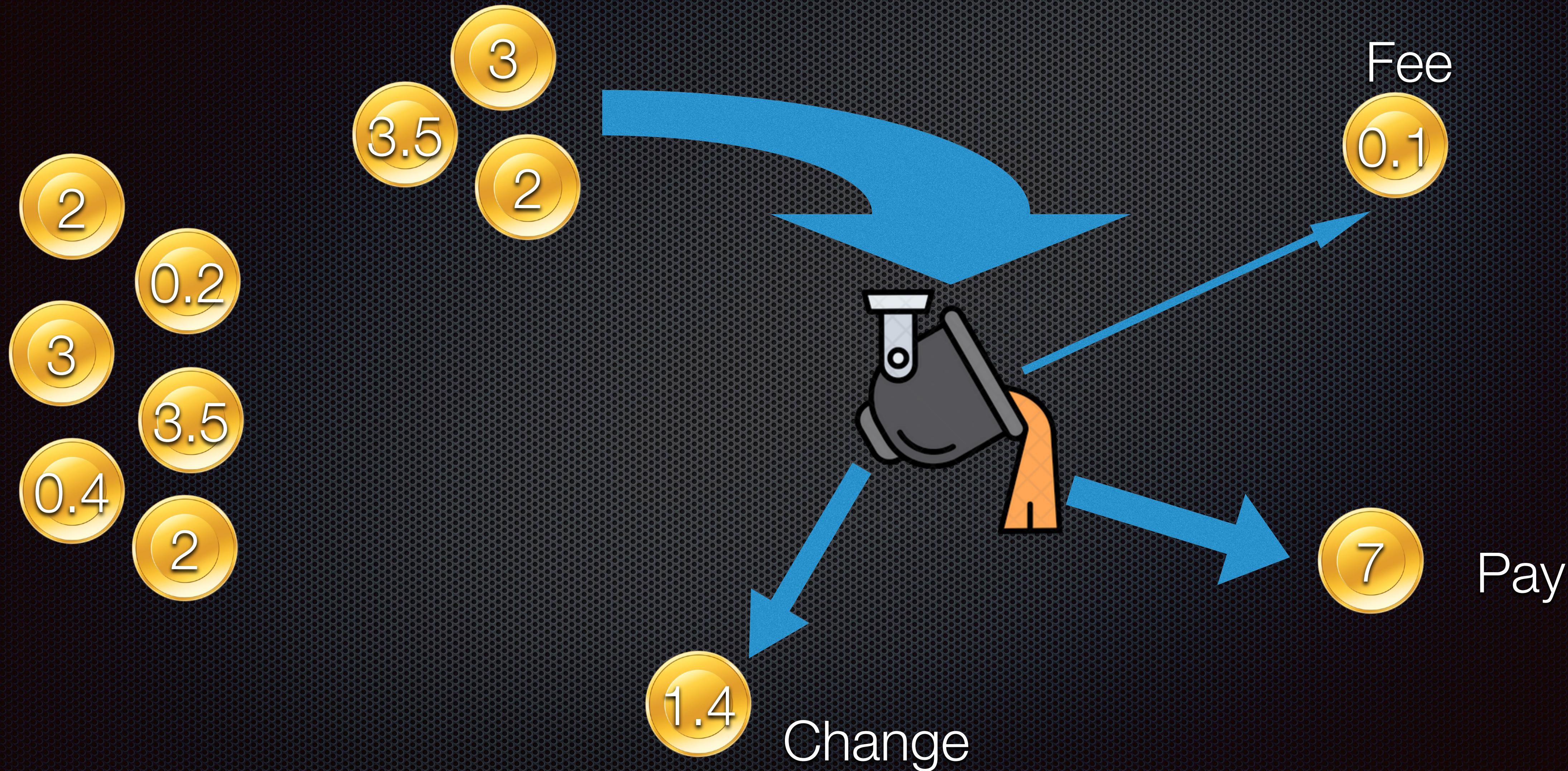
## Bitcoin Transaction

5950c2bbf1adb1a5fbbc050d06918cddb97d8e0855ec5cd24d57b61e076a2785 [Copy](#)

STATUS	4 Confirmations
INCLUDED IN BLOCK	00000000000000000000000000000042a2c4e3910c5ccd48b4b2d624f08b4b5a413b98af4ea
BLOCK HEIGHT	792960
BLOCK TIMESTAMP	2023-06-05 12:50:20 GMT +1
TRANSACTION FEES	0.00002488 BTC (16.2 sat/vB)
SIZE	205 B
VIRTUAL SIZE	154 vB
WEIGHT UNITS	616 WU
VERSION	2
LOCK TIME	0
PRIVACY ANALYSIS	<a href="#">Address reuse ↗</a> <a href="#">Round payment amount ↗</a>



# Transactions / payments





[XTX]

# Standard payment

One input - two outputs (payment and change)

### Transaction

739552e40cf6edbe4d2b7e0a7d89682f1542c54b677d14cbeab116467c742f5a

2 confirmations

Timestamp	2023-06-05 17:21 (34 minutes ago)	Fee	6,304 sat \$1.67
Features	SegWit Taproot RBF	Fee rate	41.3 sat/vB
		Effective fee rate	45.9 sat/vB Optimal

### Flow

### Inputs & Outputs

	bc1qhjdnryk3t38fklele3j9ynx... 2ey5g36f	0.03600000 BTC	bc1ptrstxlc7en7hupd7ryjcm3k... 2qpgghr2	0.01046000 BTC
			bc1qhjdnryk3t38fklele3j9ynx... 2ey5g36f	0.02547696 BTC
				0.03593696 BTC



[XTX]

# Sweep payment

## Self transfer. One input - One output

79cad94dbd26228a6538fb23a2962bb4c55814fc245bd4265e2be4d51b7478b

**Transaction** [79cad94dbd26228a6538fb23a2962bb4c55814fc245bd4265e2be4d51b7478b](#) 4 confirmations

Timestamp	2023-06-08 00:20 (24 minutes ago)	Fee	9,768 sat \$2.57
Features	SegWit Taproot RBF	Fee rate	88.4 sat/vB Overpaid 3x

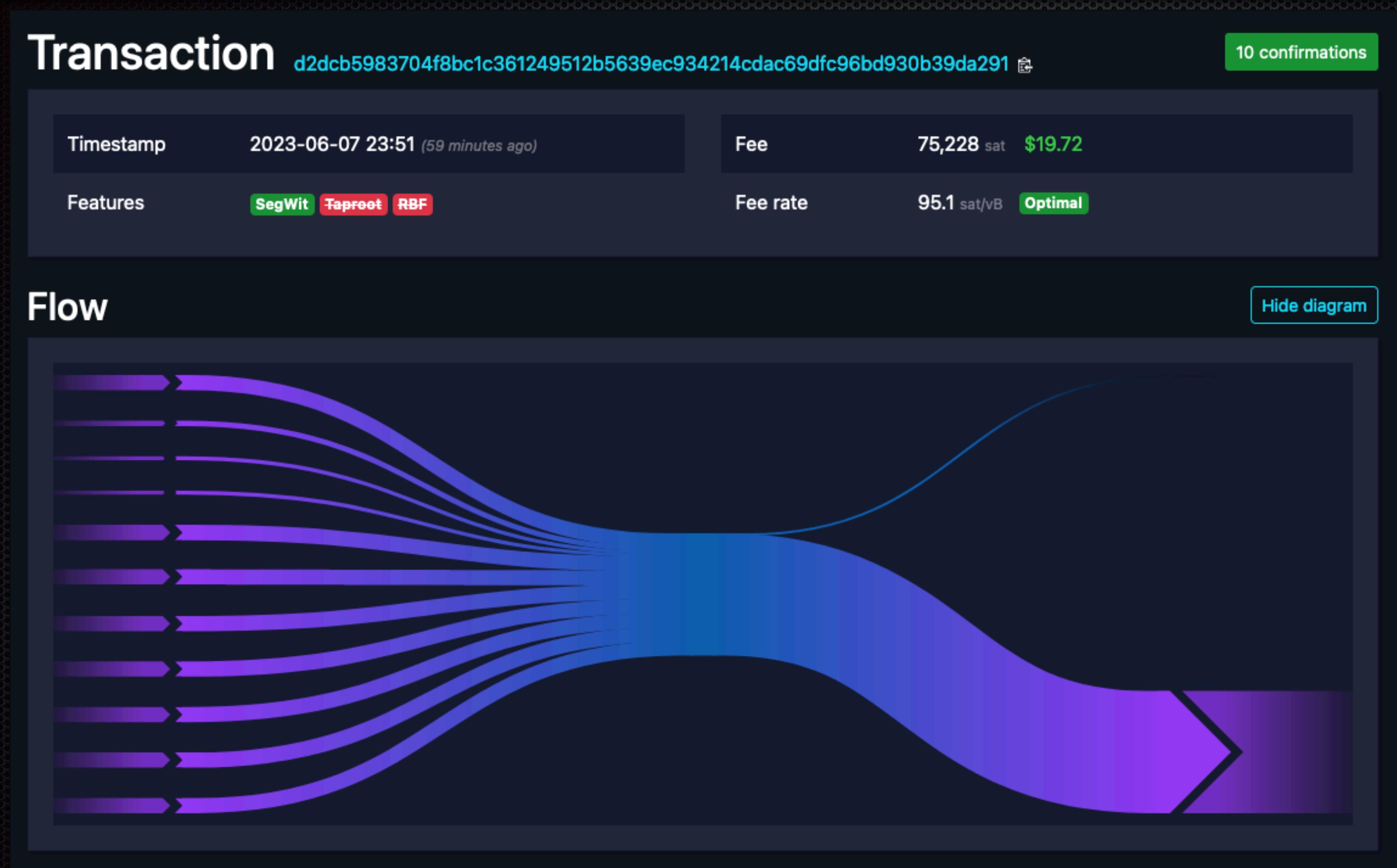
**Flow** Hide diagram

**Inputs & Outputs** Details

<a href="#">bc1qr6hf2906gj540t3e0crrp5f... j77qafy</a>	0.00124000 BTC	<a href="#">33Q9zwhY3uYMzrDY3U984bcwWUSbu5gDZ1</a>	0.00114232 BTC
			0.00114232 BTC



[XTX]





[XTX]

## Transaction [e4e3b5ecfc...468c](#) 3 confirmations

Timestamp	2023-06-05 17:21 <small>(43 minutes ago)</small>	Fee	204,286 sat <b>\$53.67</b>
Features	<b>SegWit</b> <b>Taproot</b> <b>RBF</b>	Fee rate	46.0 sat/vB
		Effective fee rate	46.0 sat/vB <b>Optimal</b>

**Flow** Hide diagram

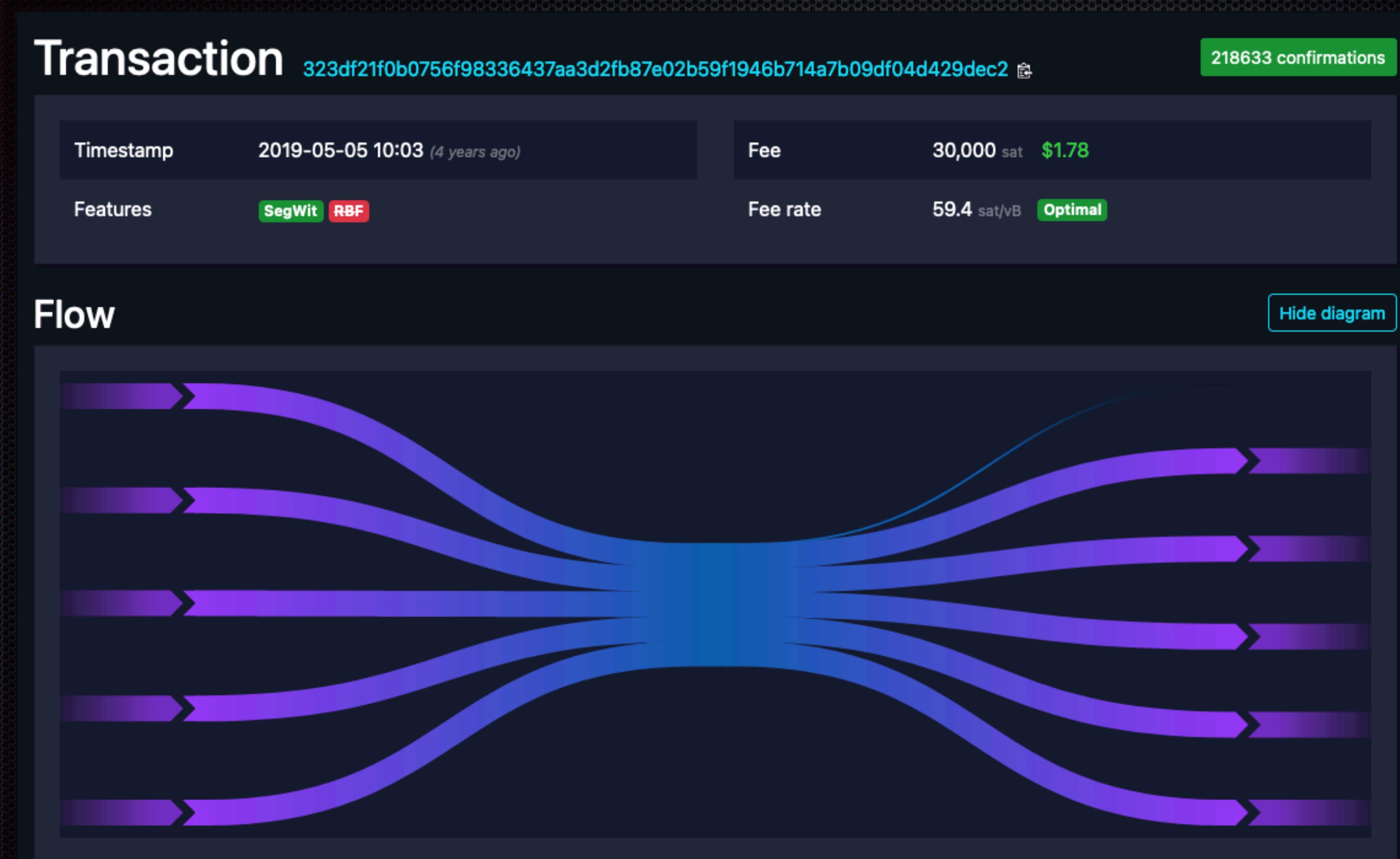
Show more



# [XTX] Coinjoin

Several inputs and outputs. Few partners.

323df21f0b0756f98336437aa3d2fb87e02b59f1946b714a7b09df04d429dec2



# RPF: Replace by Fee





**Replace-by-fee** allows the sender to replace this transaction with another similar transaction which pays a higher fee.

RBF only works while the transaction is in the mempool and soon as a transaction enters a block, it cannot be replaced by fee.

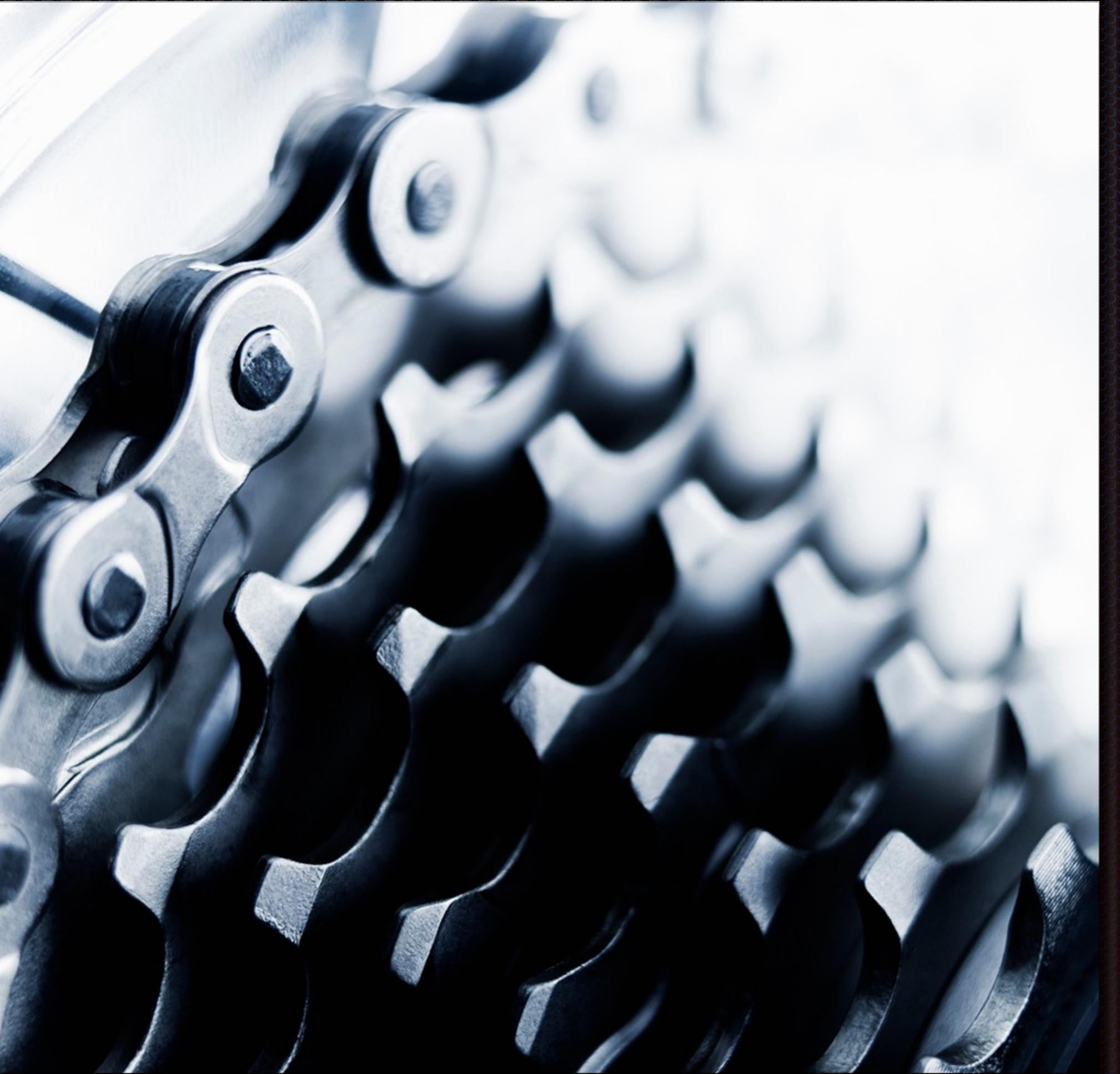
The original transaction that was first sent, it must specify that it is available to be replaced by fee in the future.

You can also replace the entire transaction, there is the option to reverse a transaction within a short period.



# RPF in Sparrow

- ❖ Be in the mempool (not yet confirmed)
- ❖ Have all inputs enabled for RBF (this is the default for transactions sent by Sparrow)
- ❖ Have all inputs from your wallet





[XTX]

001 002 X 003

**Transactions**

**Receive**

Address: tb1qjvewht845ss5hgeth33ut3g7ys2cvll407xren

Label: Tr 001

Derivation: m/84'/1'/0'/0/0

Last Used:  Never

**Required ScriptPubKey**

Script: OP\_0 <wpkh>

**Output Descriptor**

Descriptor: wpkh(02fda487980ab100a7faf414776996e4736c8d2fdb13c03dd857105199cb3b569a)



[XTX]

001 X | 002 | 003

### Transactions

B Transactions

Balance: 56,000,000 sats €13,535.66

Mempool: 0 sats

Transactions: 8 ↴

Date	Label	Value
► 2023-06-11 01:31	Internal 5 - AA faucet	4,000,000
► 2023-06-11 01:31	Internal 6 - AA faucet	6,000,000
► 2023-06-11 01:27	Internal C - AA 209	3,000,000
► 2023-06-11 01:27	Internal C - AA	4,000,000
► 2023-06-11 01:27	Internal 4 - AA faucet	6,000,000
► 2023-06-11 01:27	Internal 2 - AA faucet	8,000,000
► 2023-06-11 01:27	Internal 1 - AA faucet	10,000,000
► 2023-06-11 01:27	Internal 3 - AA faucet	15,000,000

Send

Receive



[XTX]

001 X 002 003

**Send**

Pay to: `tb1qjvevht845ss5hgeth33ut3g7ys2cvll407xren`

Label: Tr 002

Amount: 3,000,000 sats €726.03

**Fee**

Range: 1 2 4 8 16 32 64 128 256 512 1024

Rate: 1.01 sats/vB High Priority

Fee: 141 sats €0.03

Target Blocks Mempool Size

0 kB 16:29 16:35

Internal 5 - AA fa... Transaction

**Tr 002**

`tb1qc8vw...`

Fee



[XTX]

Sparrow - Tr 002

001 002 003 Tr 002 X

Tx [f08610]

Inputs  
Input #0

Outputs  
Output #0  
Output #1

Transaction

Txid: f08610367f3b8f86c37e06c2a77298b470e8fb17a60b82ba4c23946f473f562b

Internal 5 - AA faucet... Transaction Fee

Signatures

Signing Wallet: 001 ▾ Sighash: All (Recommended) ▾

Finalize Transaction for Signing



[XTX]

001 002 003 Tr 002 X

▼ Tx [f08610]  
  ▼ Inputs  
    Input #0  
  ▼ Outputs  
    Output #0  
    Output #1

Input #0  
Outpoint: d38db8473242da020fdac5b058a423ba2ad84116456c493bd489db09f7bbd551:1  
Spends: 4,000,000 sats from tb1qx7w9gd88qg32pf38p897qptrj8dn7smr5hvst7

---

Script

ScriptSig:

RedeemScript:

Witnesses:

WitnessScript:

---

Status

Signatures: 0/1

RBF:

Locktime (nSequence)

Type:

Block: 2438057



[XTX]

001 002 003 Tr 002 X

T

▼ Tx [f08610]

Inputs  
Input #0

Outputs  
Output #0  
Output #1

Transaction

Txid: f08610367f3b8f86c37e06c2a77298b470e8fb17a60b82ba4c23946f473f562b

Internal 5 - AA faucet... Transaction ↓ Tr 002   
 tb1qc8vw...  
 Fee

Signatures

Show QR Scan QR Save Transaction Load Transaction Sign

Overview Detail



[XTX]

001 002 003 Tr 002 x

▼ Tx [f08610]  
  ▼ Inputs  
    Input #0  
  ▼ Outputs  
    Output #0  
    Output #1

Transaction  
Txid: f08610367f3b8f86c37e06c2a77298b470e8fb17a60b82ba4c23946f473f562b

Internal 5 - AA faucet... Transaction ↓ Tr 002 tb1qc8vw...  
 Fee

Signatures  
BIP39

View Final Transaction Broadcast Transaction



[XTX]

001 X 002 003 Tr 002

**Transactions**

Balance: 52,999,859 sats €12,808.4

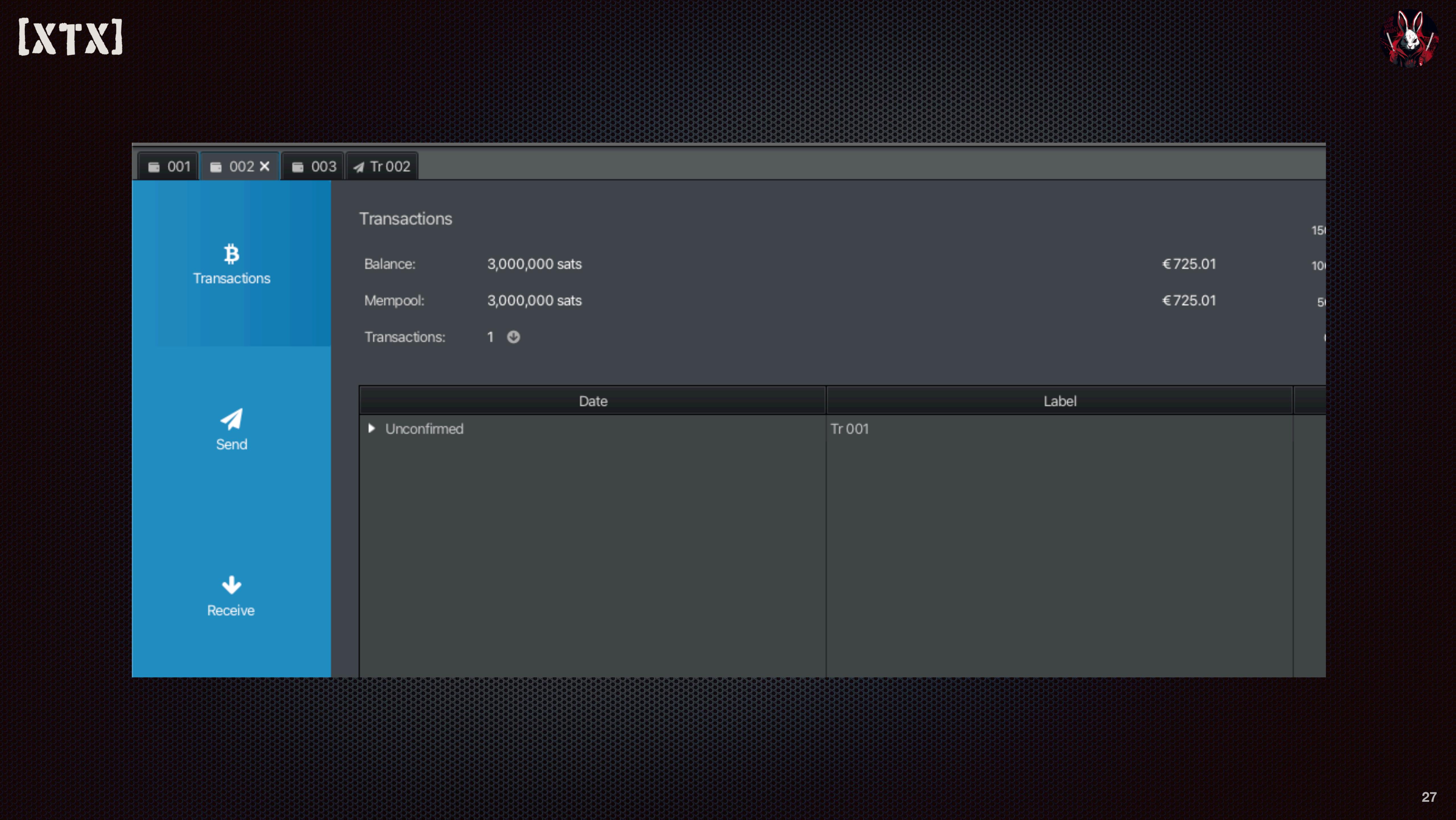
Mempool: -3,000,141 sats

Transactions: 9 ⓘ

**Send**

**Receive**

Date	Label	Value
► Unconfirmed	Tr 002	(+) -3,000,141
► 2023-06-11 01:31	Internal 5 - AA faucet	4,000,000
► 2023-06-11 01:31	Internal 6 - AA faucet	6,000,000
► 2023-06-11 01:27	Internal C - AA 209	3,000,000
► 2023-06-11 01:27	Internal C - AA	4,000,000
► 2023-06-11 01:27	Internal 4 - AA faucet	6,000,000
► 2023-06-11 01:27	Internal 2 - AA faucet	8,000,000
► 2023-06-11 01:27	Internal 1 - AA faucet	10,000,000
► 2023-06-11 01:27	Internal 3 - AA faucet	15,000,000





[XTX]

001 002 003 Tr 002 X

▼ Tx [f08610]  
  ▼ Inputs  
    Input #0  
  ▼ Outputs  
    Output #0  
    Output #1

Transaction  
Txid: f08610367f3b8f86c37e06c2a77298b470e8fb17a60b82ba4c23946f473f562b

Internal 5 - AA faucet... Transaction ↓ Tr 002 tb1qc8vw...  
 Fee

---

Blockchain  
Status: Unconfirmed



[XTX]

# Transaction

f08610367f3b8f86c37e06c2a77298b470e8fb17a60b82ba4c23946f473f562b ⓘ

Unconfirmed

First seen

2 minutes ago

Fee

141 sat \$0.00

ETA

In ~11 minutes

Fee rate

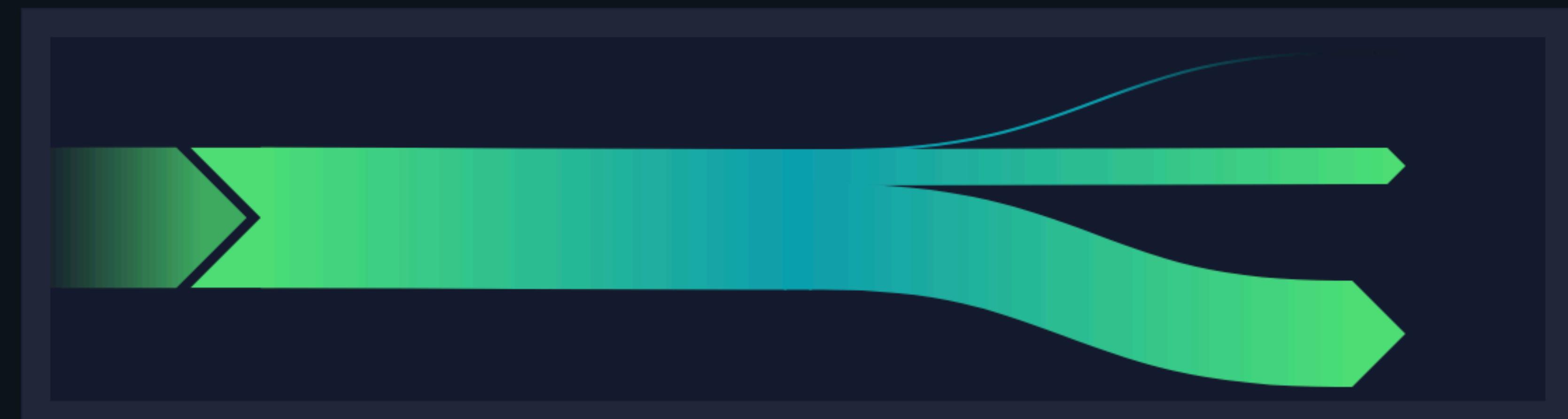
1.01 sat/vB

Features

SegWit Taproot RBF

## Flow

Hide diagram



## Inputs & Outputs

Details

→ tb1qx7w9gd88qg32pf38p897qpt... mr5hvst7

0.04000000 tBTC

tb1qc8vwhd6aycquqjh7gf7udf6... zpc7v29u

0.00999859 tBTC ➔

tb1qjvewht845ss5hgeth33ut3g... l407xren

0.03000000 tBTC ➔

0.03999859 tBTC



[XTX]

001 X 002 003

### Transactions

Bitcoin Transactions

Balance: 52,999,859 sats

Mempool: -3,000,141 sats

Transactions: 9 ⓘ

Send

Receive

Date	Label	Value
► Unconfirmed	Tr 002	○ -3,000,141
► 2023-06-11 01:27	Internal 5 - AA faucet	4,000,000
► 2023-06-11 01:27	Internal 6 - AA faucet	6,000,000
► 2023-06-11 01:27	Internal C - AA 209	3,000,000
► 2023-06-11 01:27	Internal C - AA	4,000,000
► 2023-06-11 01:27	Internal 4 - AA faucet	6,000,000
► 2023-06-11 01:27	Internal 2 - AA faucet	8,000,000
► 2023-06-11 01:27	Internal 1 - AA faucet	10,000,000
► 2023-06-11 01:27	Internal 3 - AA faucet	15,000,000

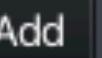
- View Transaction
- Increase Fee (RBF)
- Cancel Transaction (RBF)
- Increase Effective Fee (CPFP)
- Open in Block Explorer
- Copy Transaction ID



[XTX]

001 X 002 003

Send

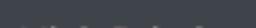
Pay to: tb1qjvewht845ss5hgeth33ut3g7ys2cvll407xren  

Label: Tr 002 (Replaced By Fee)

Amount: 3,000,000 sats € 725.47 Max (1 UTXO selected)

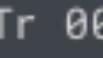
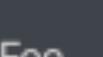
Fee

Range: 1 2 4 8 16 32 64 128 256 512 1024

Rate: 2.17 sats/vB High Priority 

Fee: 305 sats € 0.07 0 kB 16:29 16:45

↓  
Receive

Internal 5 - AA fa...  Transaction  Tr 002 (Re...  tb1q4rhu...  Fee

Addresses



[XTX]

001 X | 002 | 003 | Tr 002 (Replaced By Fee)

### Transactions

Balance: 52,999,695 sats €12,816.50

Mempool: -3,000,305 sats

Transactions: 9 ↓

Date	Label	Value
▼ Unconfirmed	Tr 002 (Replaced By Fee)	○ -3,000,305
Spent d38db847...:1	Tr 002 (Replaced By Fee) (input)	4,000,000
Change to 836a9cc2...:0	Tr 002 (Replaced By Fee) (change)	999,695
▶ 2023-06-11 01:31	Internal 5 - AA faucet	4,000,000
▶ 2023-06-11 01:31	Internal 6 - AA faucet	6,000,000
▶ 2023-06-11 01:27	Internal C - AA 209	3,000,000
▶ 2023-06-11 01:27	Internal C - AA	4,000,000
▶ 2023-06-11 01:27	Internal 4 - AA faucet	6,000,000
▶ 2023-06-11 01:27	Internal 2 - AA faucet	8,000,000
▶ 2023-06-11 01:27	Internal 1 - AA faucet	10,000,000
▶ 2023-06-11 01:27	Internal 3 - AA faucet	15,000,000

Send

Receive

≡

**[XTX]**

This transaction has been replaced by:

836a9cc2d096c3efe897218f5211b1956d8087bdc8243d64edcbce1448abcfcc

## Transaction

f08610367f3b8f86c37e06c2a77298b470e8fb17a60b82ba4c23946f473f562b

Replaced

First seen

4 minutes ago

Fee

141 sat \$0.00

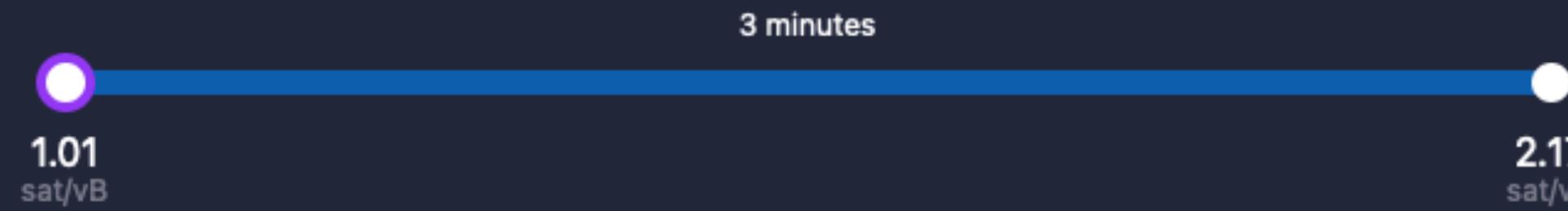
Features

SegWit RBF

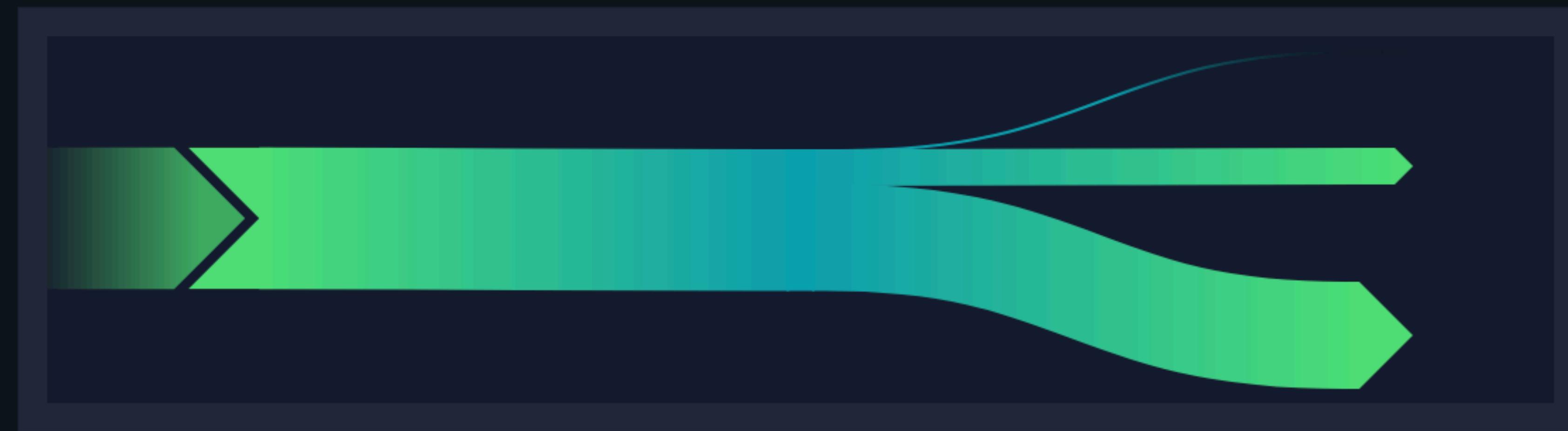
Fee rate

1.01 sat/vB

## RBF History



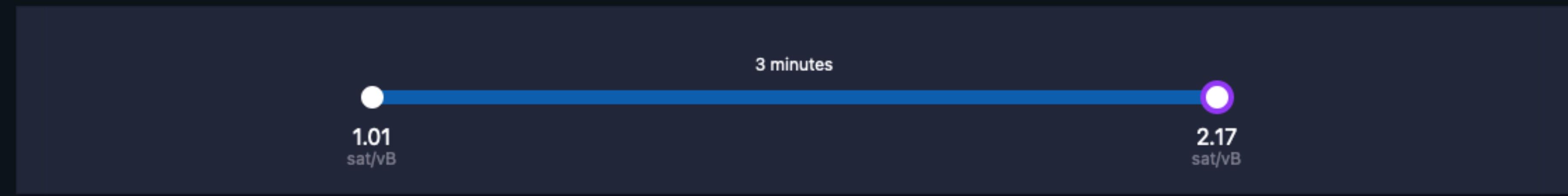
## Flow





[XTX]

## RBF History



## Flow

[Hide diagram](#)



## Inputs & Outputs

[Details](#)

 tb1qx7w9gd88qg32pf38p897qpt... mr5hvst7

0.04000000 tBTC

tb1q4rhujqwqazg9amj0kg263d2... 4vxhz9d8

0.00999695 tBTC 

tb1qjvewh845ss5hgeth33ut3g... l407xren

0.03000000 tBTC 

# CPFP: Child Pays For Parent





[XTX]

Child Pays for Parent: you're creating a new transaction (Child) using the funds of the delayed one (parent) and then resending it with a much higher fee.

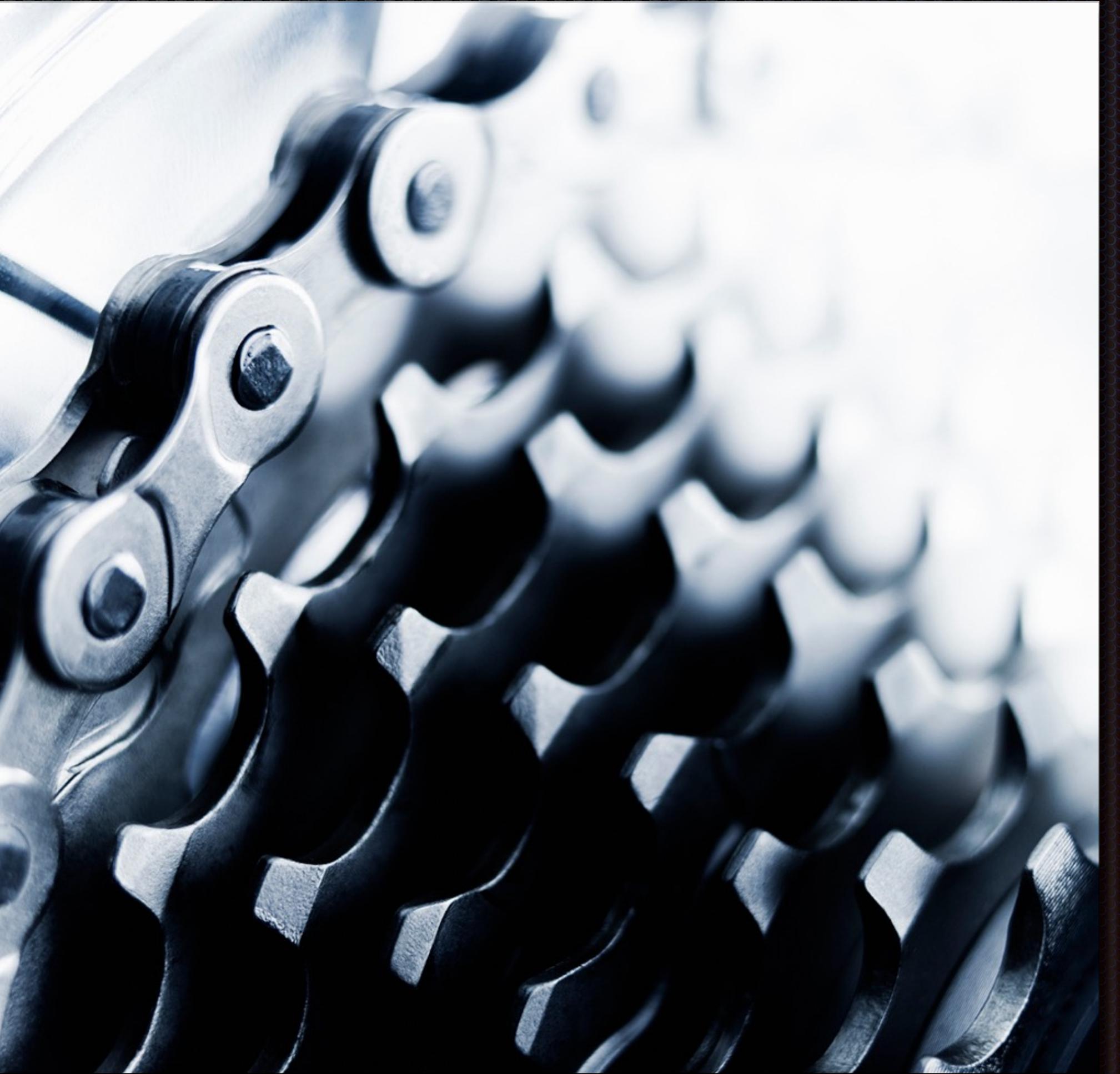
It will cause miners to consider confirming the parent transaction, it is rational for miners to implement it (they make more money).

It is not a change in the protocol, but in miner strategy.



# CPFP in Sparrow

- Be in the mempool (not yet confirmed)
- Have rights over the outputs.





[XTX]

001 002 003 004 X

Receive

Address: `tb1qagpxh5yw0mz3fn9zd6fmkkwfv0az0lyu0pe7`

Label:

Derivation: `m/84'/1'/0'/0/0`

Last Used:  Never

QR Code:

Required ScriptPubKey

Script: `OP_0 <wpkh>`

Output Descriptor

Descriptor: `wpkh(02a9a20e2a46cc3ddfe66c89f686a1ea7676172d0a3211aa8f87e677998c1efe1a)`



[XTX]

001 X 002 003 004

### Transactions

Balance: 43,999,419 sats €10,625.13

Mempool: 0 sats

Transactions: 10 ⓘ

**Send**

**Receive**

**Addresses**

Date	Label	Value
► 2023-06-17 19:34	Trx 003 CPFP	(+) -9,000,276
► 2023-06-17 16:49	Tr 002 (Replaced By Fee)	-3,000,305
► 2023-06-11 01:31	Internal 5 - AA faucet	4,000,000
► 2023-06-11 01:31	Internal 6 - AA faucet	6,000,000
► 2023-06-11 01:27	Internal C - AA 209	3,000,000
► 2023-06-11 01:27	Internal C - AA	4,000,000
► 2023-06-11 01:27	Internal 4 - AA faucet	6,000,000
► 2023-06-11 01:27	Internal 2 - AA faucet	8,000,000
► 2023-06-11 01:27	Internal 1 - AA faucet	10,000,000
► 2023-06-11 01:27	Internal 3 - AA faucet	15,000,000



# [XTX]

001 X 002 003 004

**B**  
Transactions

**Send**

Pay to:

Label:

Amount:  sats  €1,931.87

**Fee**

Range:  1 2 4 8 16 32 64 128 256 512 1024

Rate: 1.00 sats/vB High Priority

Fee:  sats  €0.05

Target Blocks  Mempool Size

**Receive**

**Addresses**

```
graph LR; A((Internal 2 - AA fa...)) --> B((Trx 003 CPFP (ch...))); B -- Transaction --> C((tb1qw669...)); B -- Transaction --> D((Fee))
```



[XTX]

## Transaction

deb720259a0836c67d53a1cad6c32b51eaea23dacb358aa8b2e685784d007e3a ↗

Unconfirmed

First seen

Just now

Fee

209 sat \$0.00

ETA

In ~1 minute

Fee rate

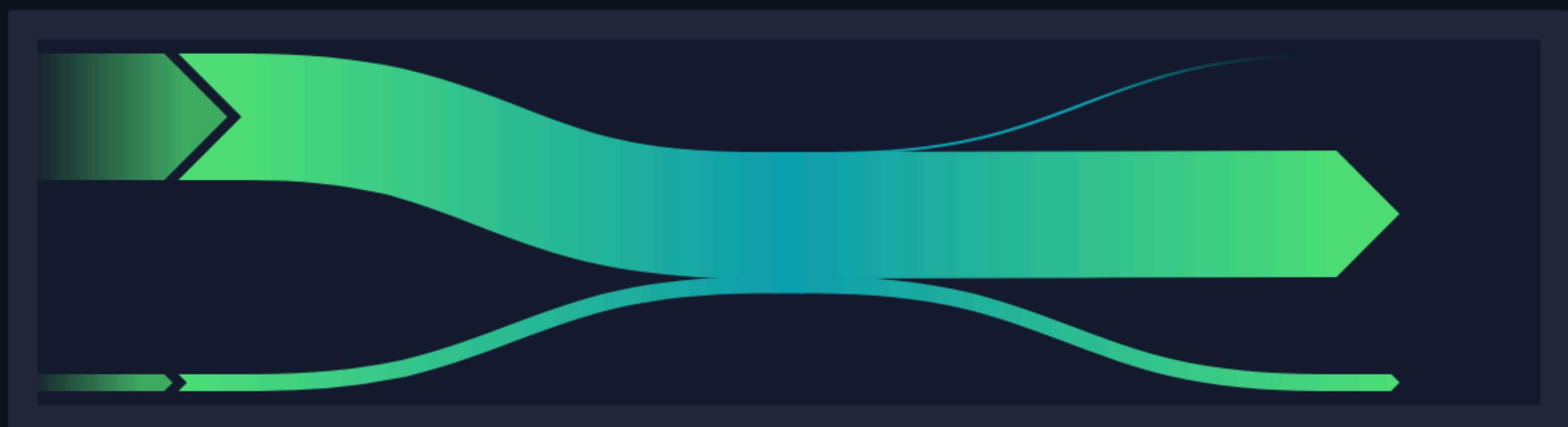
1.00 sat/vB

Features

SegWit Taproot RBF

## Flow

Hide diagram



## Inputs &amp; Outputs

Details

tb1qyr2fhmm9z7qlqg7wylqc5pp... qqy6ktv2

0.08000000 tBTC

tb1qagpxh5yw0mz3fn9zd6fmkk... 0lyu0pe7

0.08000000 tBTC ↗

tb1q3n245kemy4c8gsafx3s6nl4... yk9er8cq

0.00999419 tBTC

tb1qw669dfnkaa3kc74ndxufmda... j3m3ewgs

0.00999210 tBTC ↗

0.08999210 tBTC



001 002 003 004 tx CPFP 004

Transactions

Bitcoin Transactions

Balance: 8,000,000 sats €1,934.81

Mempool: 8,000,000 sats €1,934.81

Transactions: 1 ↓

Send

Unconfirmed tx CPFP 004 8,000,000

Receive

Date	Label	Value
► Unconfirmed	tx CPFP 004	○ 8,000,000



[XTX]

001 002 003 004 tx CPFP 004

Transactions

Balance: 8,000,000 sats

Mempool: 8,000,000 sats

Transactions: 1 ↴

Date Label Value

Date	Label	Value
▶ U	tx CPFP 004	8,000,000

View Transaction  
Increase Effective Fee (CPFP)  
Open in Block Explorer  
Copy Transaction ID

Send

Receive

Addresses



[XTX]

001 002 003 004 tx CPFP 004

Send

Transactions

Pay to: tb1qhvywpqyldpj6tpdqu66fg6xgdkz0ptmxmxa + Add

Label: tx CPFP 004 (CPFP)

Amount: 7,998,000 sats €1,934.33 Max (1 UTXO selected)

Fee

Send

Range: 1 2 4 8 16 32 64 128 256 512 1024

Target Blocks Mempool Size

Rate: 18.31 sats/vB ➔ CPFP High Priority ●

Fee: 2,000 sats €0.48 0 kB 19:27 19:56

Receive

Addresses

tx CPFP 004 (rec...) Transaction Fee

```
graph LR; Recipient["tx CPFP 004 (rec...)"] --> Transaction["Transaction"]; Transaction --> Sender["tx CPFP 004 (rec...)"]; Transaction --> Fee["Fee"];
```



[XTX]

001 002 003 004 X tx CPFP 004 tx CPFP 004 (CPFP)

**B**  
Transactions

Send

Receive

Transactions

Balance: 7,998,000 sats

Mempool: 7,998,000 sats

Transactions: 2

Date	Label	Value
► Unconfirmed Parent	tx CPFP 004 (CPFP)	<input type="radio"/> -2,000
► Unconfirmed	tx CPFP 004	<input type="radio"/> 8,000,000



[XTX]

# Transaction

[fc2931a2b74830263517f4c791dd6df66aab89eeb6c0c2c1cc2af48a7d4f2fc2](#) ⓘ

Unconfirmed

First seen

Just now

Fee

2,000 sat \$0.00

ETA

In ~1 minute

Fee rate

18.3 sat/vB

Features

SegWit Taproot RBF

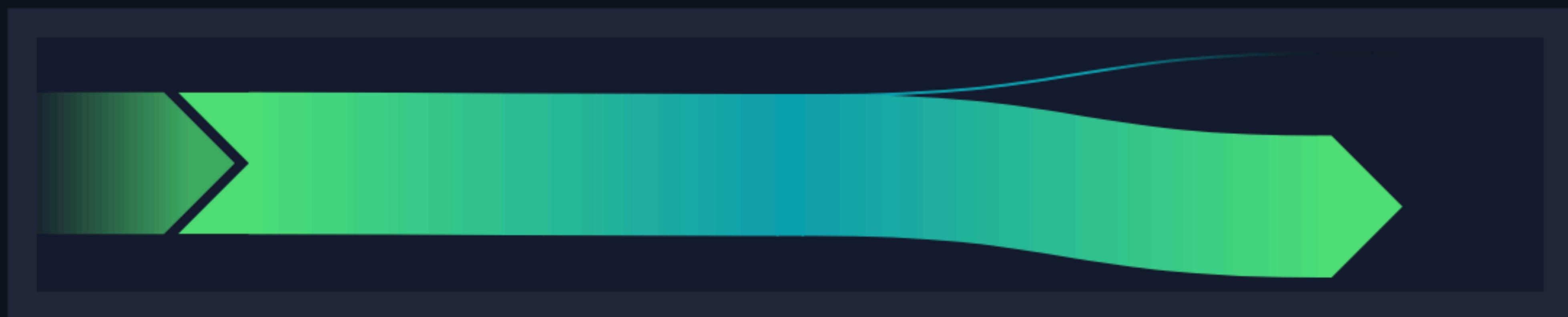
Effective fee rate

6.96 sat/vB

CPFP ⓘ

## Flow

Hide diagram



## Inputs & Outputs

Details

→ [tb1qagpfhx5yw0mz3fn9zd6fmkk... 0lyu0pe7](#)

0.08000000 tBTC

[tb1qhvywpqyldpj6tpdqxu66fg... ptmxmxza](#)

0.07998000 tBTC →

0.07998000 tBTC



## Which one should you use?

If you're the spender and want your transaction to confirm faster, use RBF. If you received a payment and are unable to convince the sender to up the fee, or the transaction is marked as non-replaceable, use CPFP.

**Better yet, send your transaction with the proper fee the first time**



# Notes:

- RBF: Transactions has a finger print (chain analysis)
- RBF is cheaper than CPFP, one transaction vs two transactions.
- You can use CPFP in the change amount.
- There is a limit in the amount of CPFP you can concatenate.
- RBF and CPFP do not guarantee it will be applied.



# Bitcoin: A Peer-to-Peer Electronic Cash System

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**Abstract.** A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main