



# Welcome

Adam Jonas - Bitcoin Optech

*May 14, 2019*



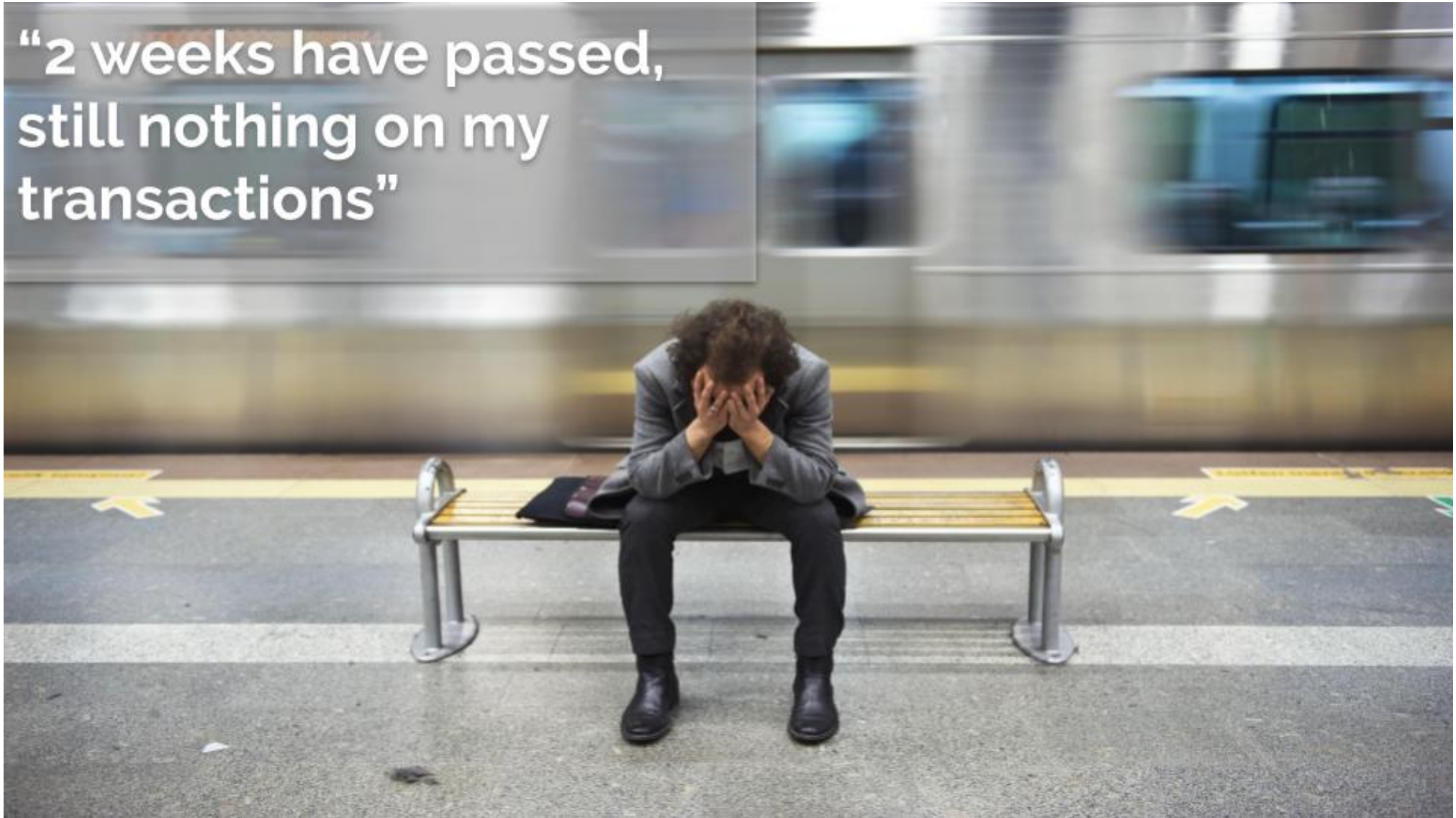
# A return to fees

Mike Schmidt - Bitcoin Optech

*May 14, 2019*



“2 weeks have passed,  
still nothing on my  
transactions”





“\$25 sent  
\$16 fee  
\$41 total

40% of the total  
transaction in  
fees.

unbelievable”



# Thrive in a Bitcoin fee market



- 
- **Why fees?**
  - **Fee Challenges**
  - **Fee Solutions**
  - **Discussion**



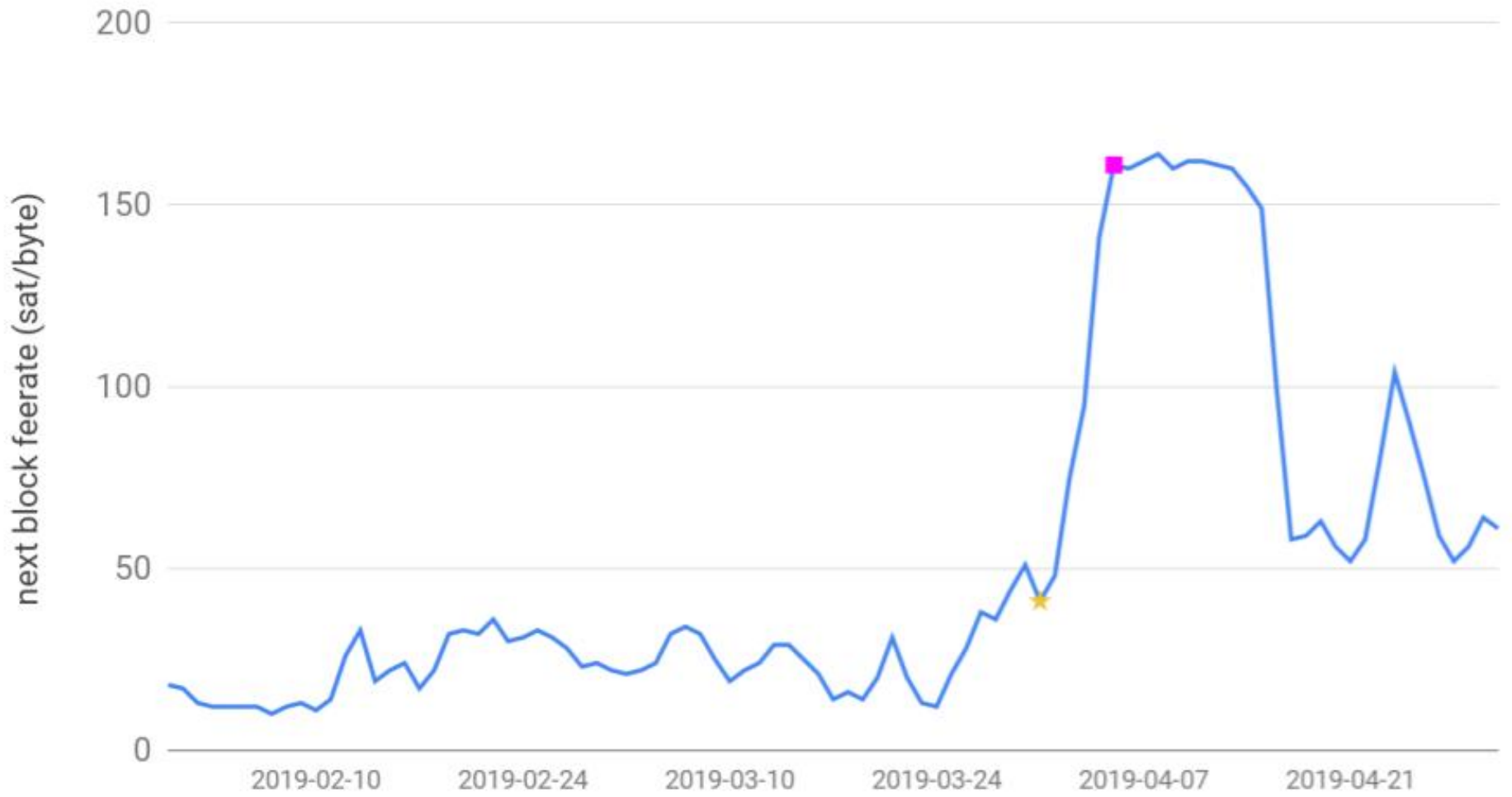
# A history of Bitcoin fees

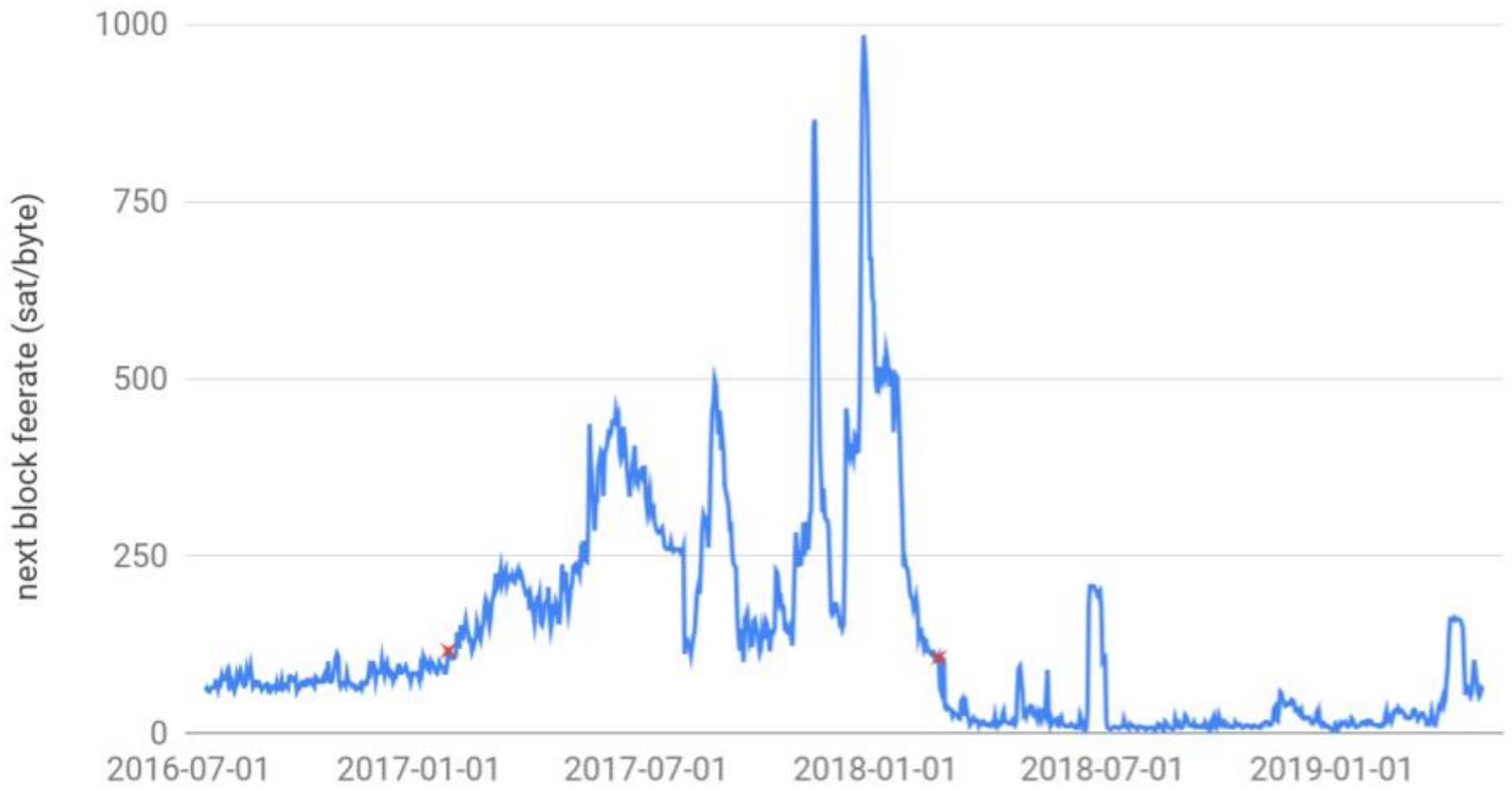












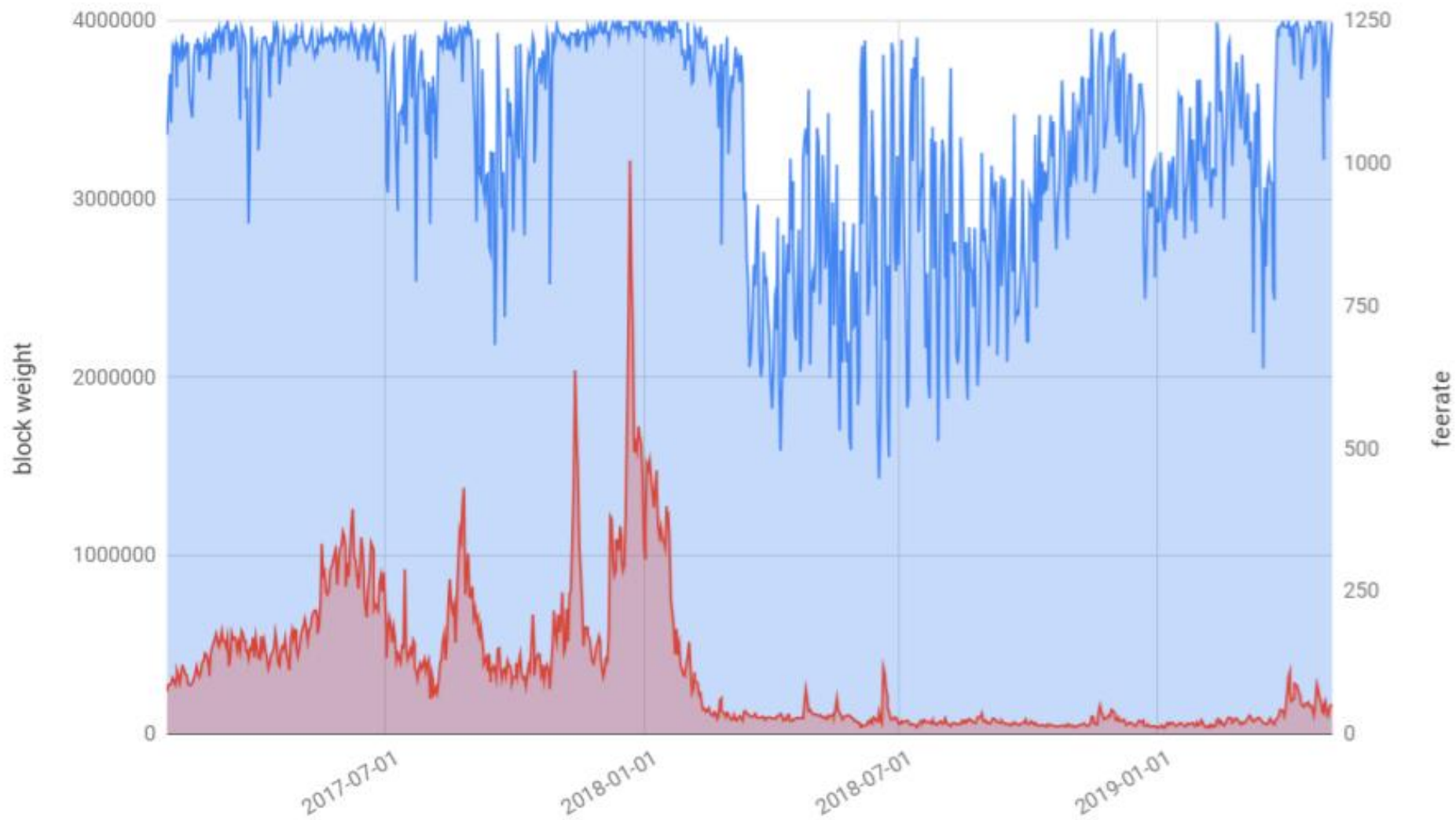
**Thriving in the context of fee  
spikes AND sustained fees**

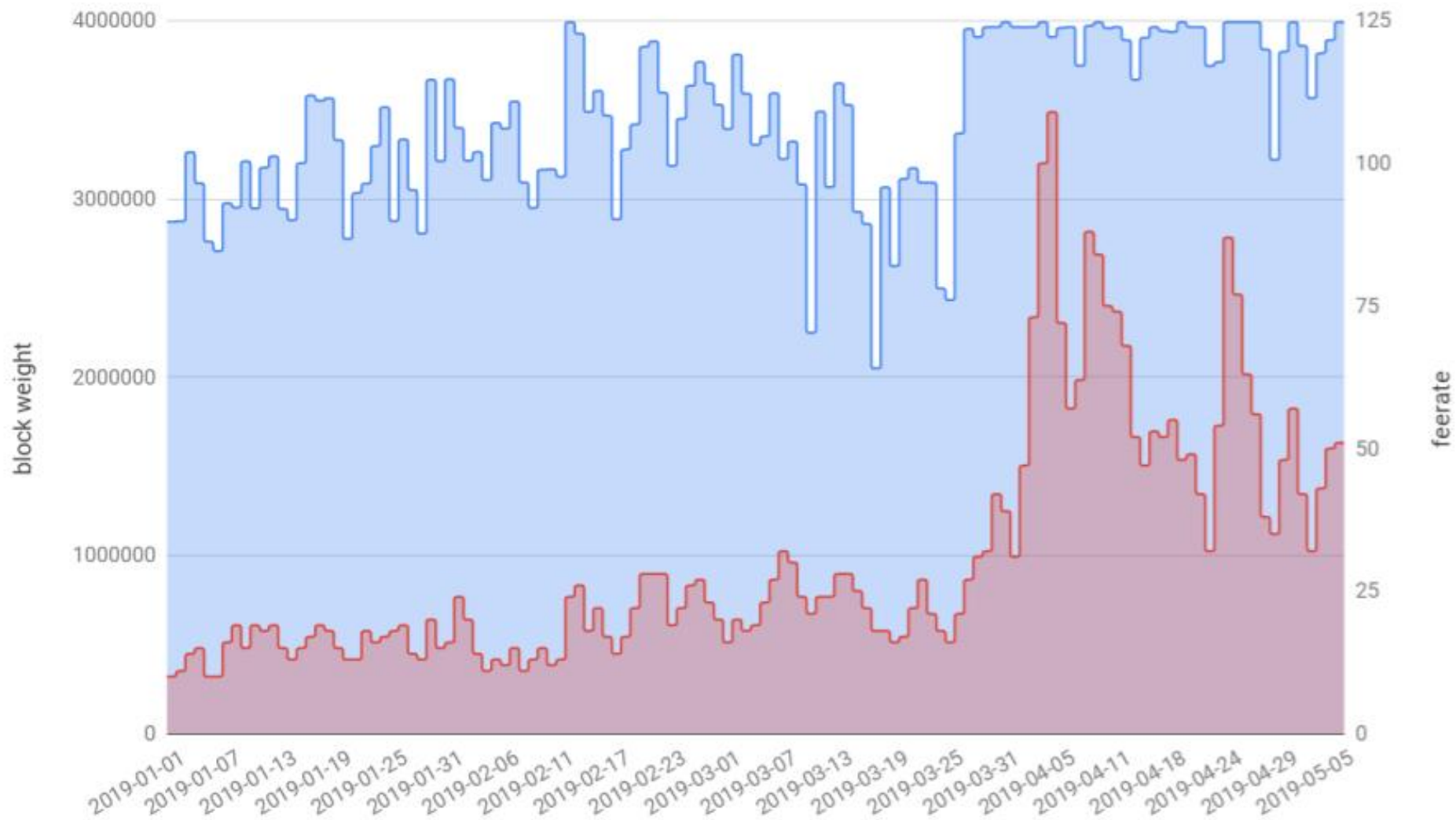


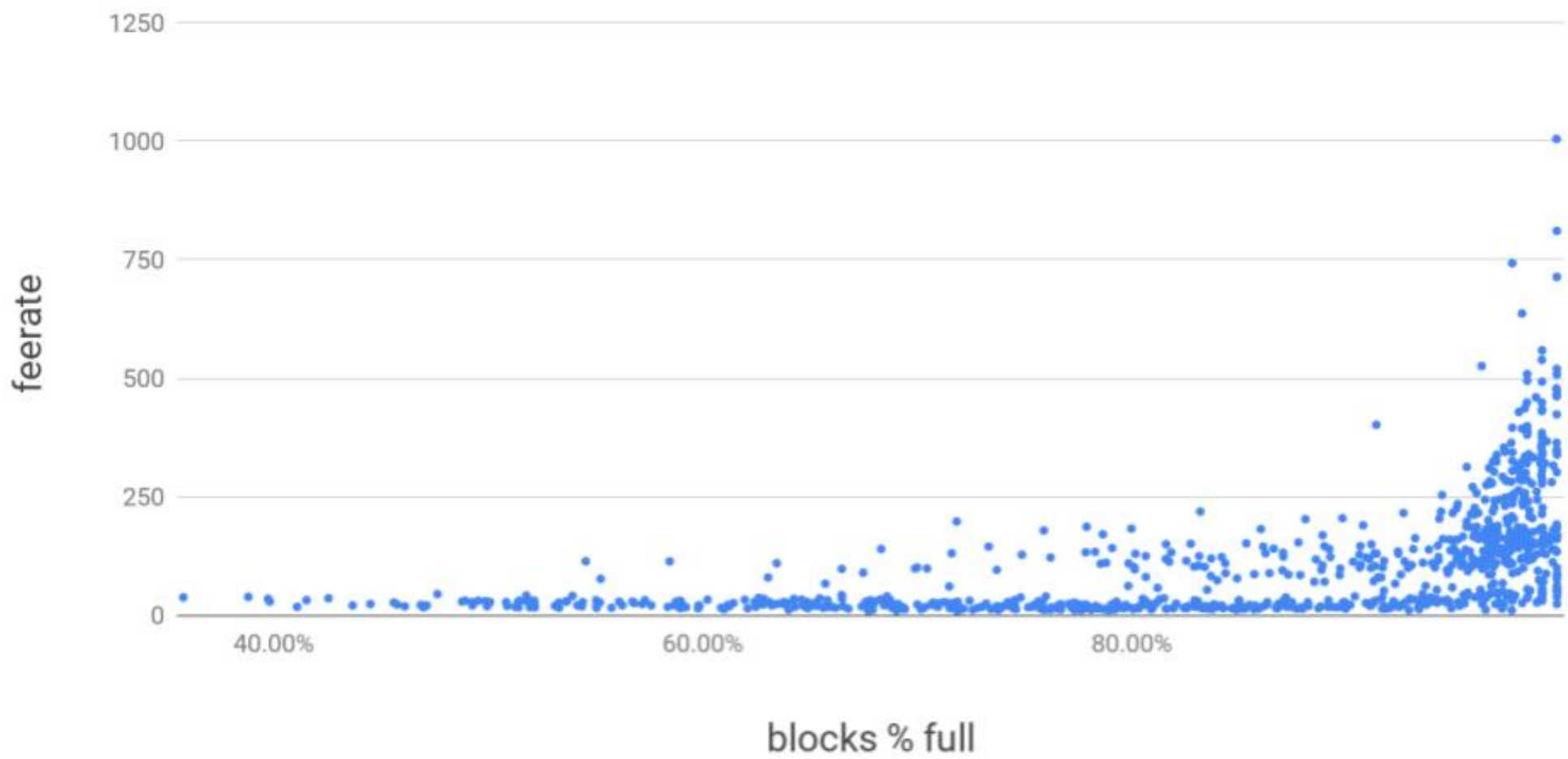
# A future of Bitcoin fees















# Challenges



**Costs**



**Confusion**

**Thriving means addressing  
increased costs AND user  
confusion**

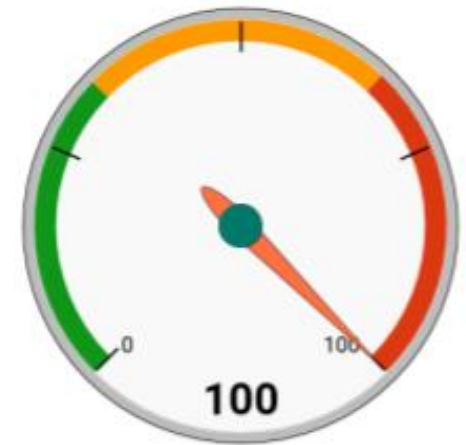




# Solutions



# Handling Fees




**Sustained Fees**

**Fee Spikes**

**Costs**

**Usability**

	<b>Sustained Fees</b>	<b>Fee Spikes</b>
<b>Costs</b>		
<b>Usability</b>		



**“Seawalls are best built  
during low tide”**



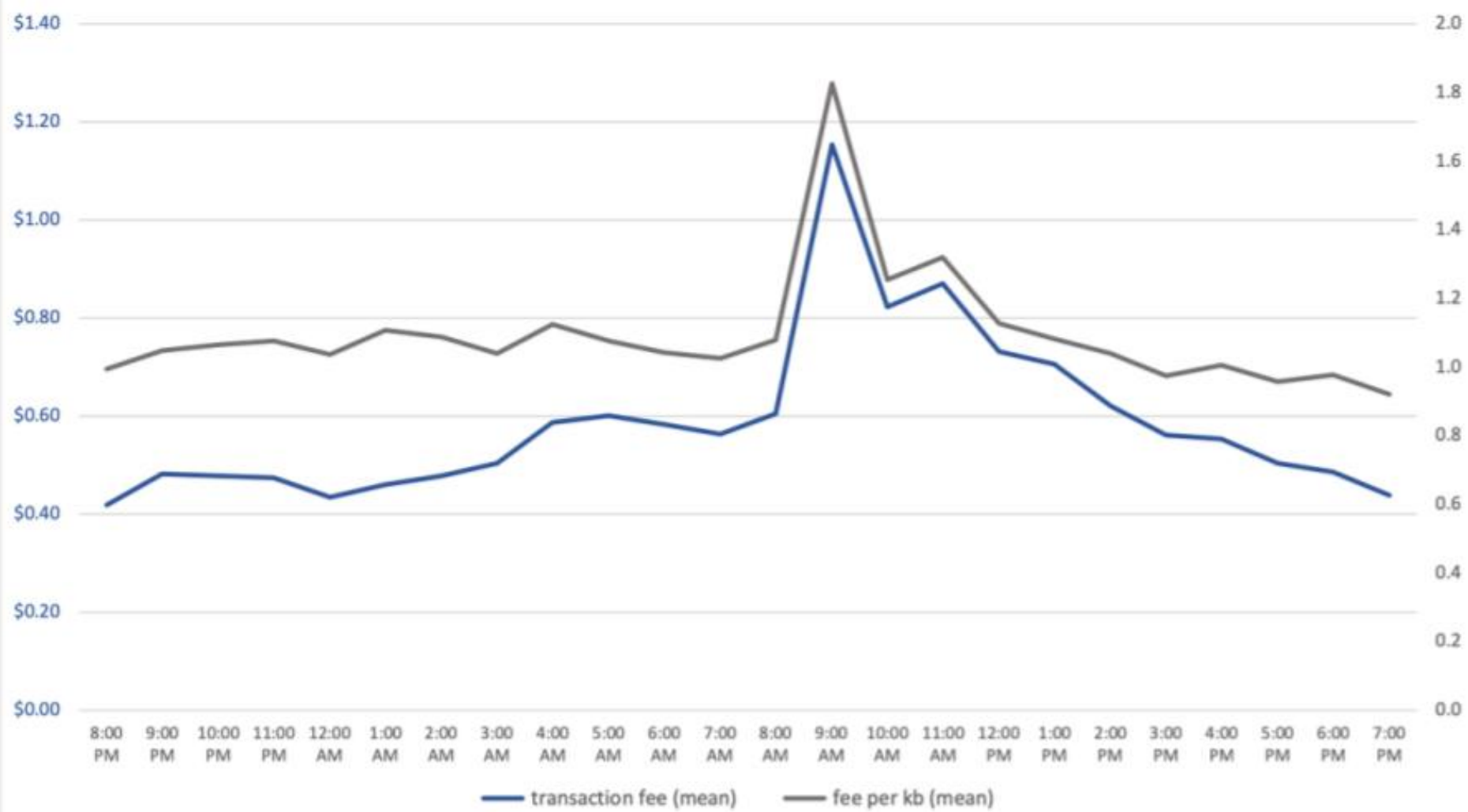


**Solutions -  
Existing  
Technology**



**Dynamic Fee Estimation**

Bitcoin average fee rates by hour, June 2018 – present (eastern time)







# Solutions

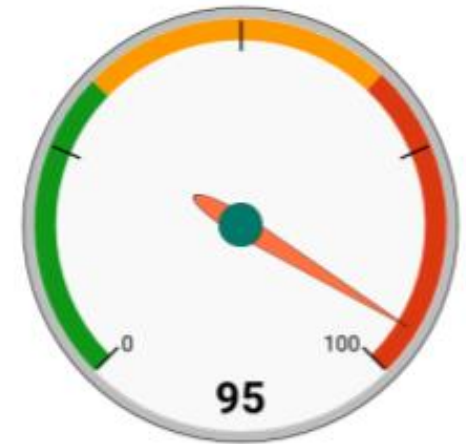
## Sustained Fees

## Fee Spikes

Costs

- Dynamic Fee Estimation

Usability





**Coin Selection**



## Why: Coin Selection

- Avoid change
  - Saves fees now (one less output) and in future (one less input)
- Spend non segwit outputs during low feerates
  - Get rid of higher feerate outputs while fees are low
- Spend more, lower value outputs (consolidate) during low feerates
  - Some outputs are uneconomical to spend depending on feerate

# Solutions



## Sustained Fees

## Fee Spikes

Costs

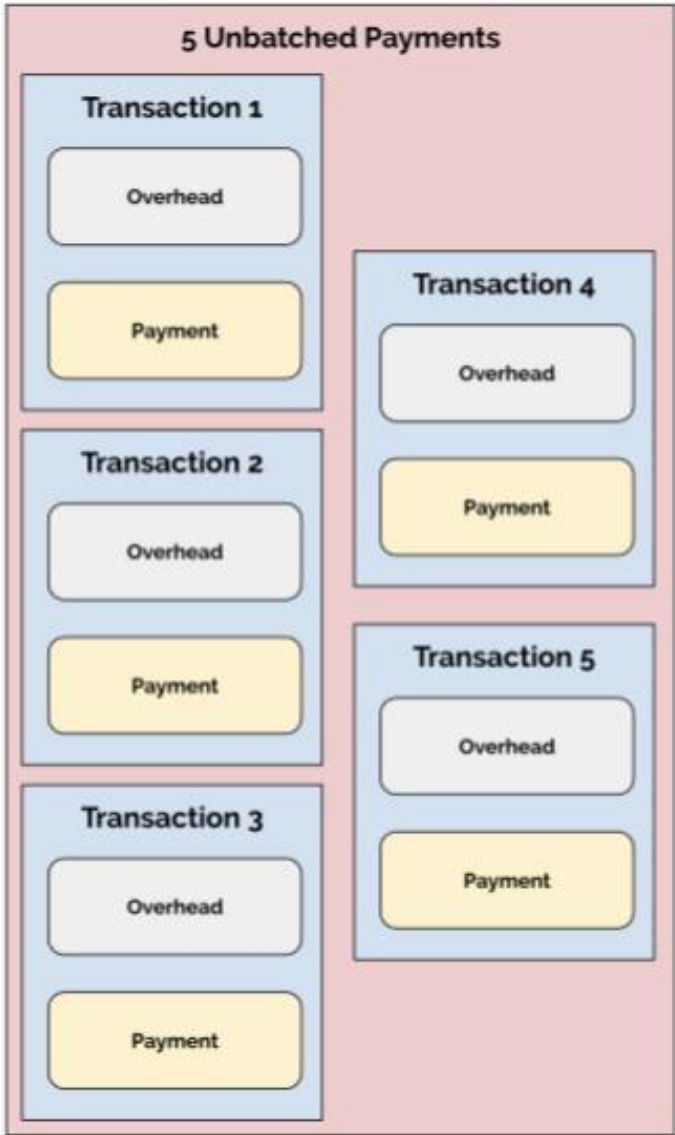
- Coin Selection

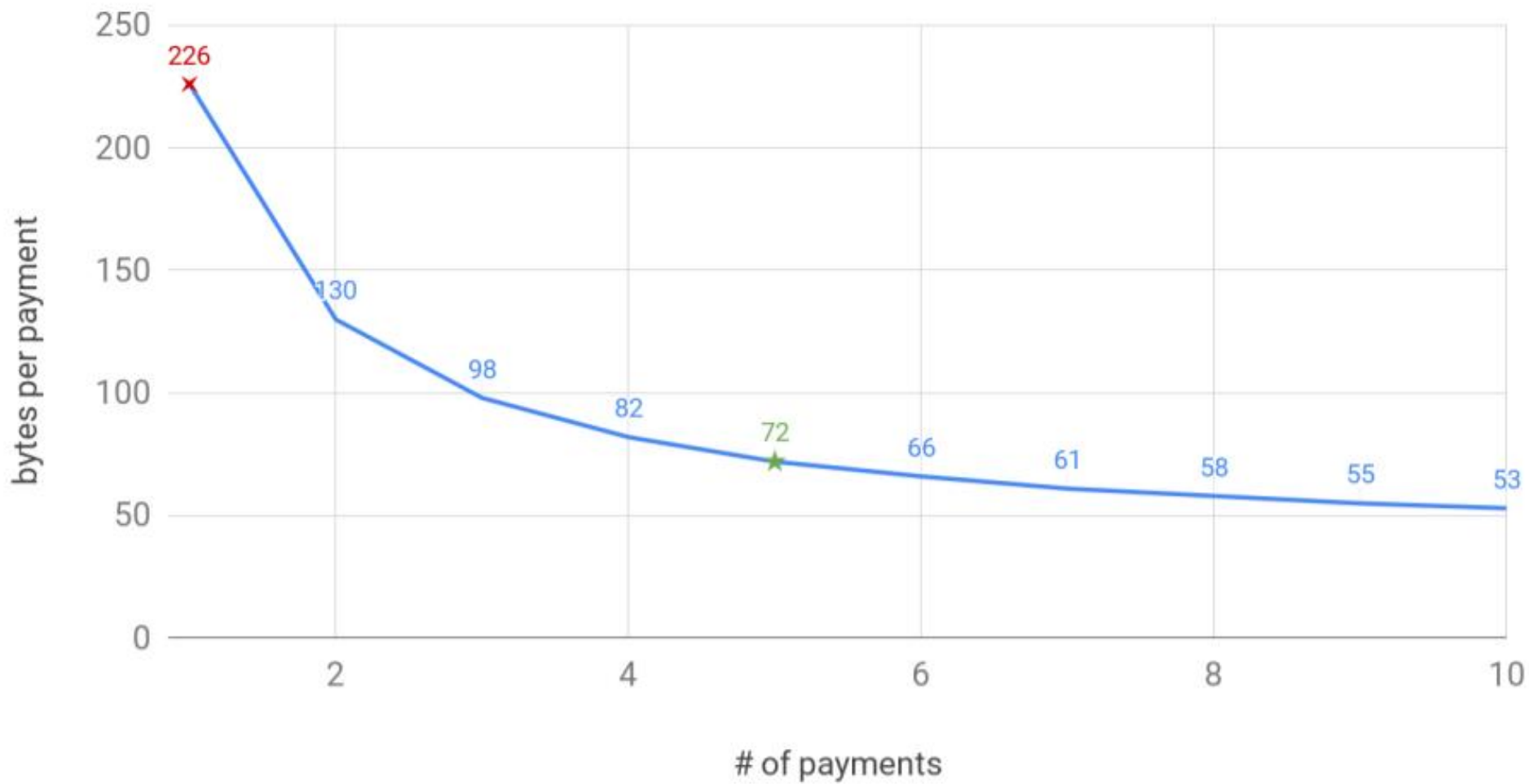
- Dynamic Fee Estimation

Usability

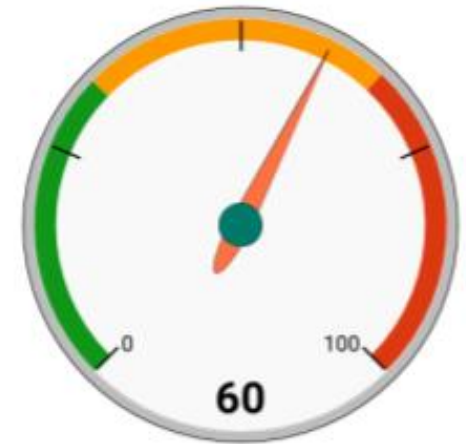



**Payment Batching**





# Solutions

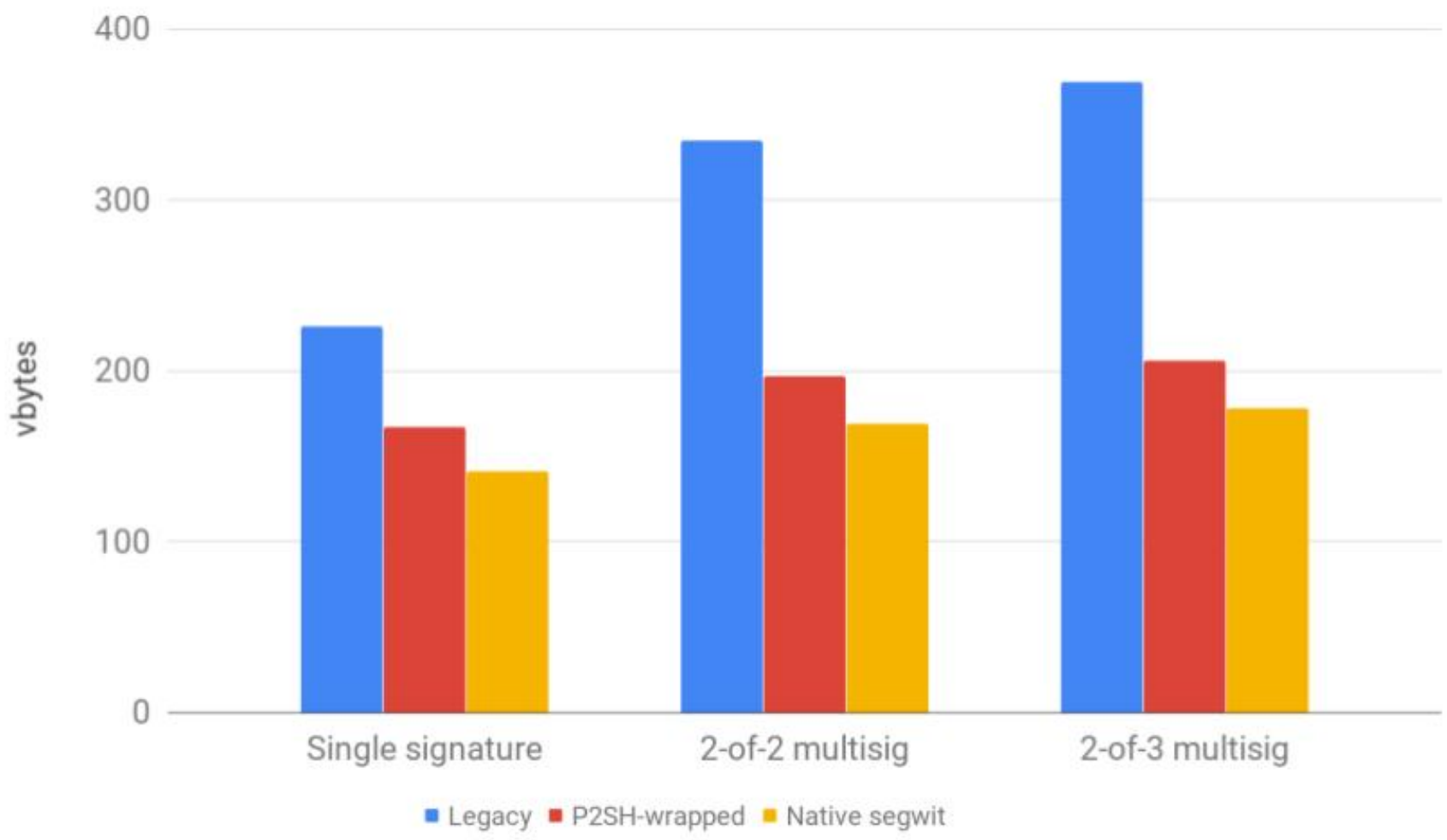


	Sustained Fees	Fee Spikes
Costs	<ul style="list-style-type: none"><li>• Payment Batching</li><li>• Coin Selection</li></ul>	<ul style="list-style-type: none"><li>• Dynamic Fee Estimation</li></ul>
Usability		

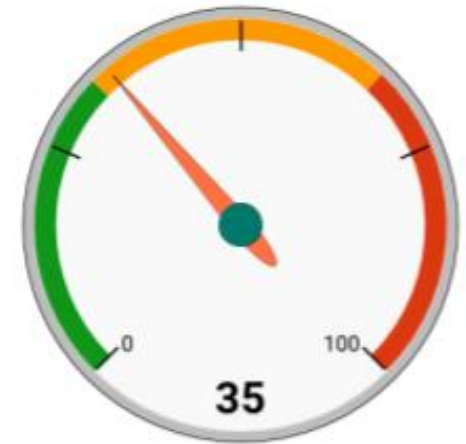




SegWit



# Solutions



	Sustained Fees	Fee Spikes
Costs	<ul style="list-style-type: none"><li>• Payment Batching</li><li>• Segregated Witness</li><li>• Coin Selection</li></ul>	<ul style="list-style-type: none"><li>• Dynamic Fee Estimation</li></ul>
Usability		



**UTXO  
Consolidation**

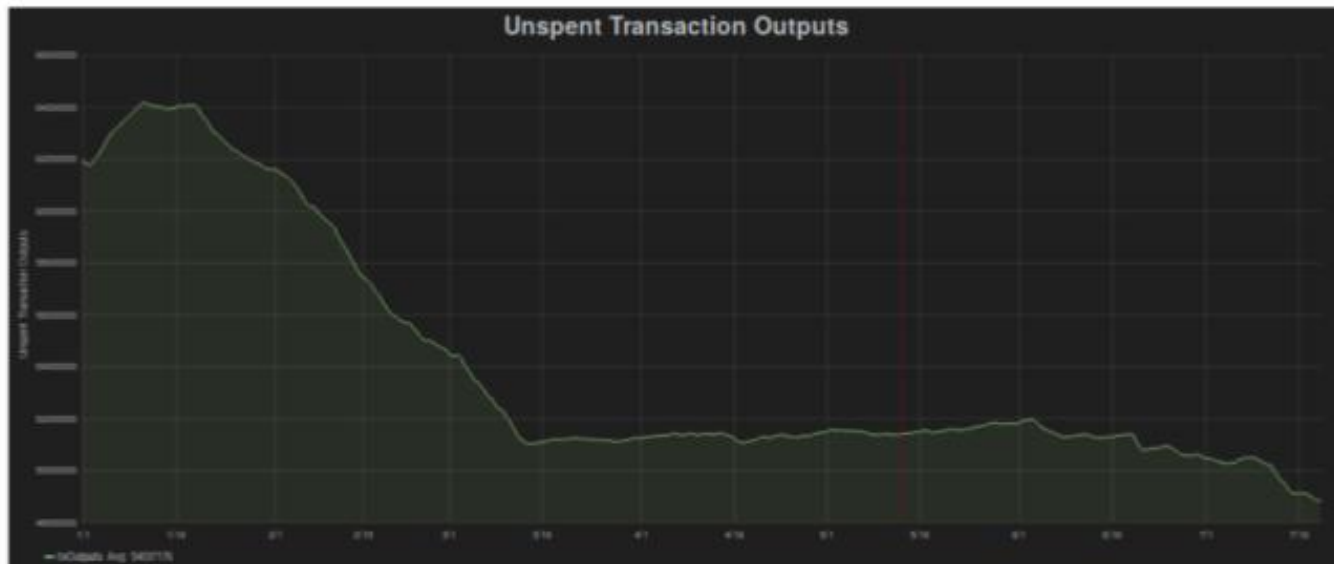
# Field Report: Consolidation of 4 Million UTXOs at Xapo

Jul 30, 2018

by [Anthony Towns](#)

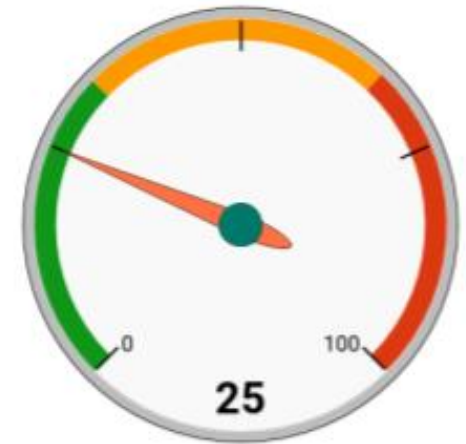
Developer on Bitcoin Core at [Xapo](#)

As mentioned in [newsletter #3](#), the past few months of low transaction fees makes it a great time to do UTXO consolidation! Consolidation has been one of a variety of activities [Xapo](#) has been undertaking to be prepared for the next time fees spike like they did in the last few months of 2017.



Plot of total Bitcoin UTXOs, January - July 2018, source: [Statoshi](#)

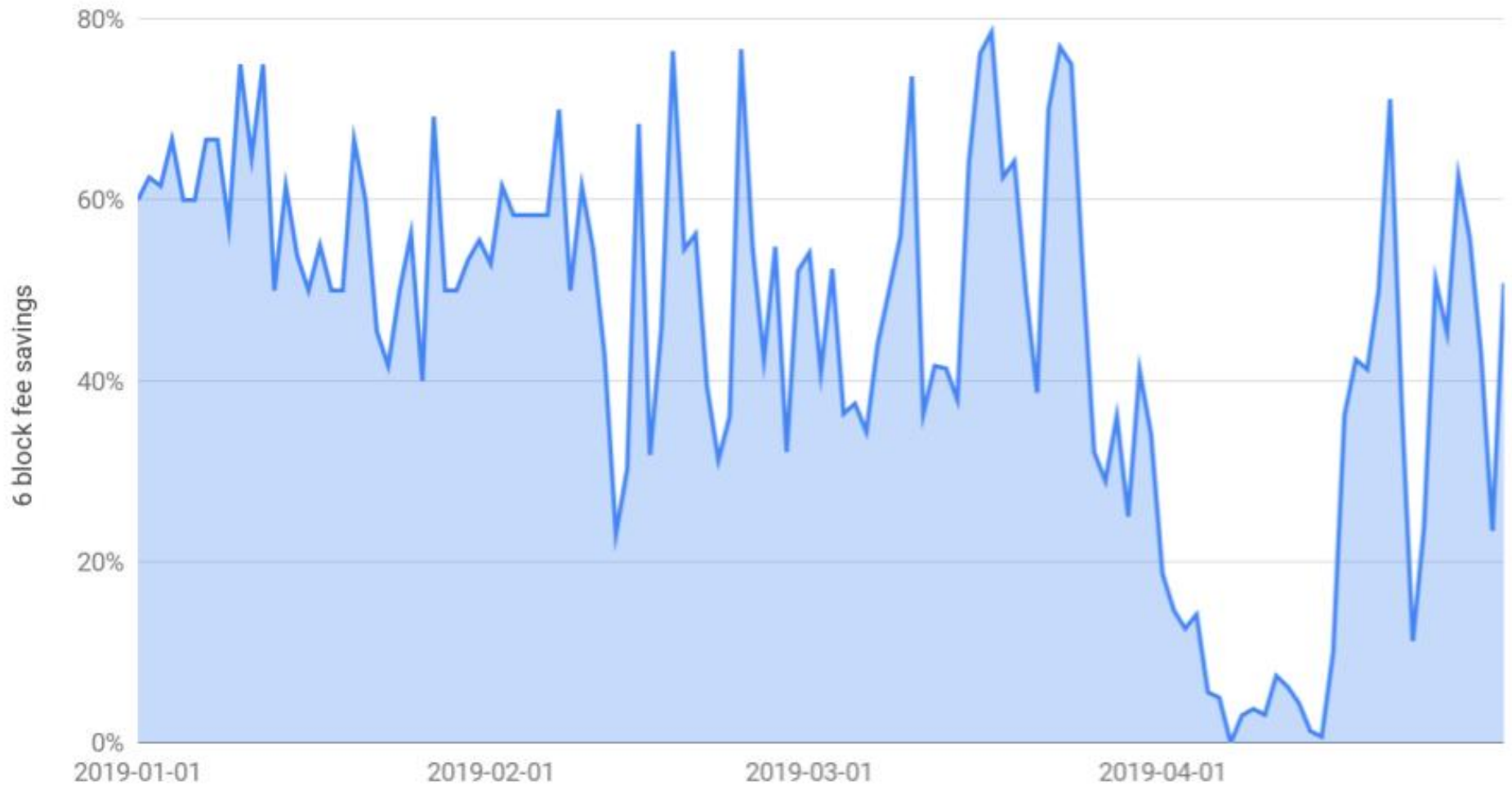
# Solutions



	Sustained Fees	Fee Spikes
Costs	<ul style="list-style-type: none"><li>• Payment Batching</li><li>• Segregated Witness</li><li>• Coin Selection</li></ul>	<ul style="list-style-type: none"><li>• Dynamic Fee Estimation</li><li>• UTXO Consolidation</li></ul>
Usability		

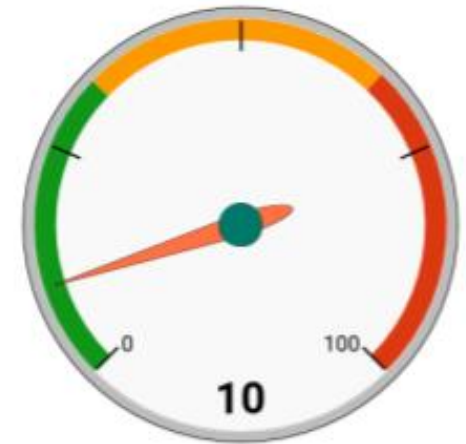
# Patient Spending







# Solutions



## Sustained Fees

## Fee Spikes

### Costs

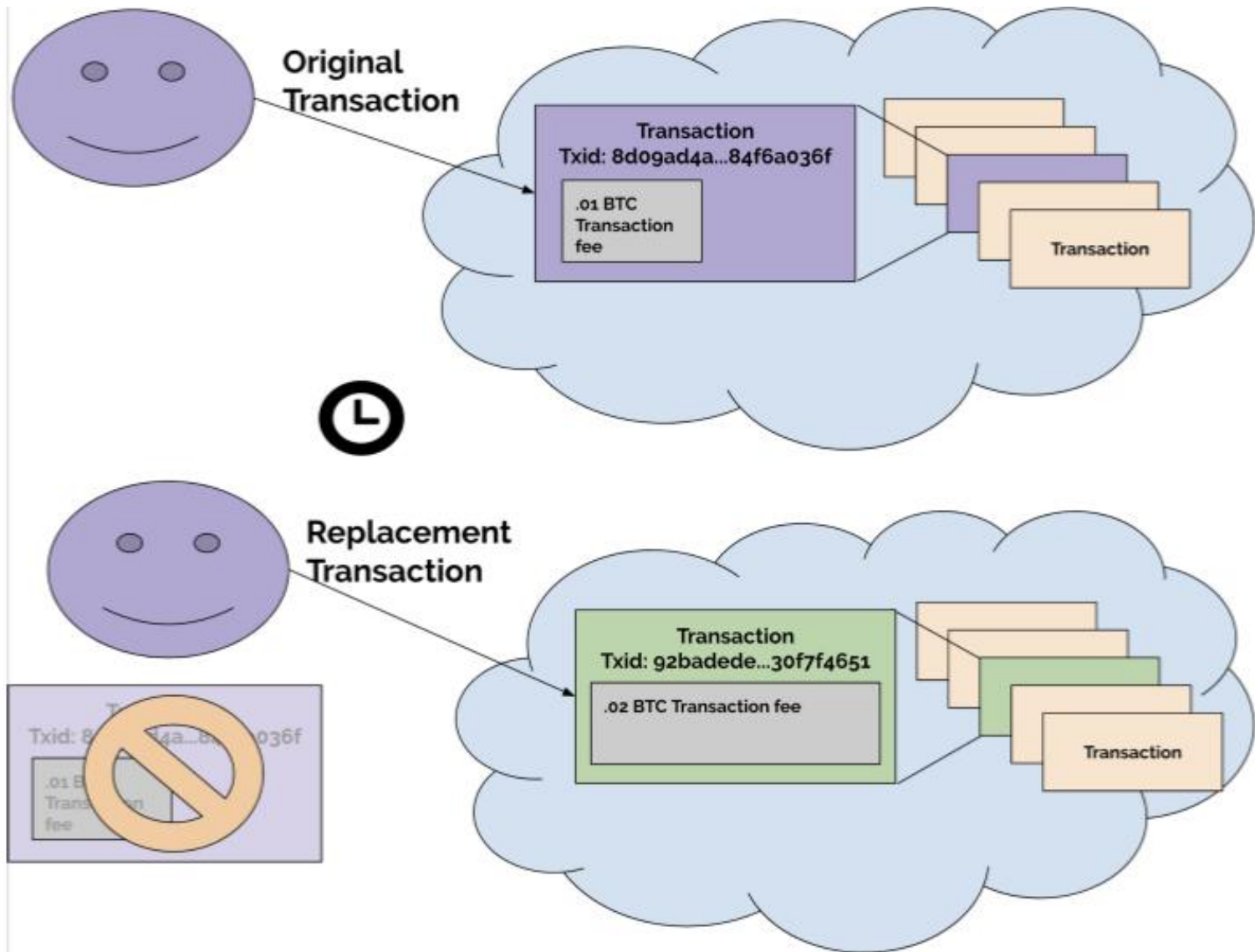
- Payment Batching
- Segregated Witness
- Coin Selection

- Dynamic Fee Estimation
- Patient Spending
- UTXO Consolidation

### Usability

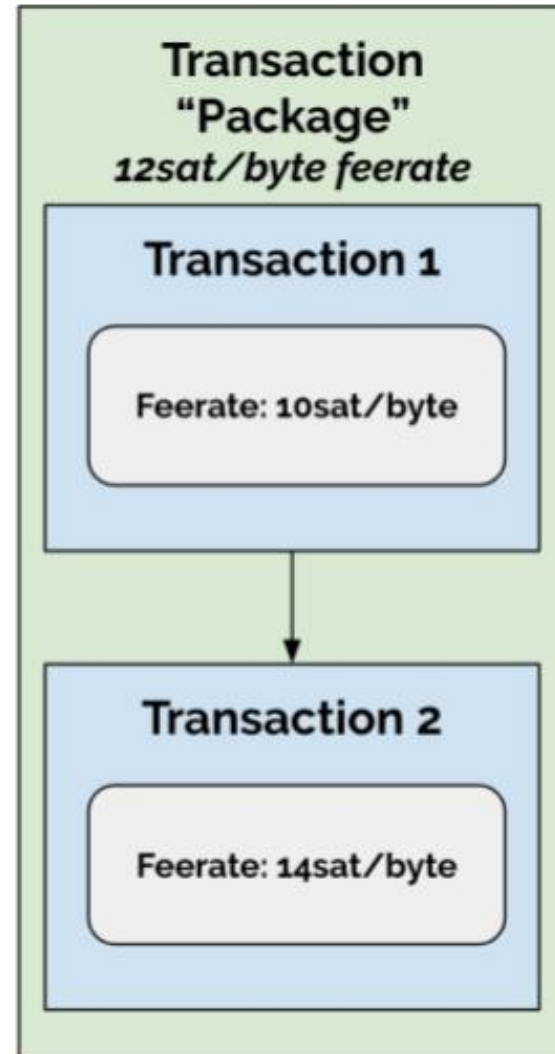
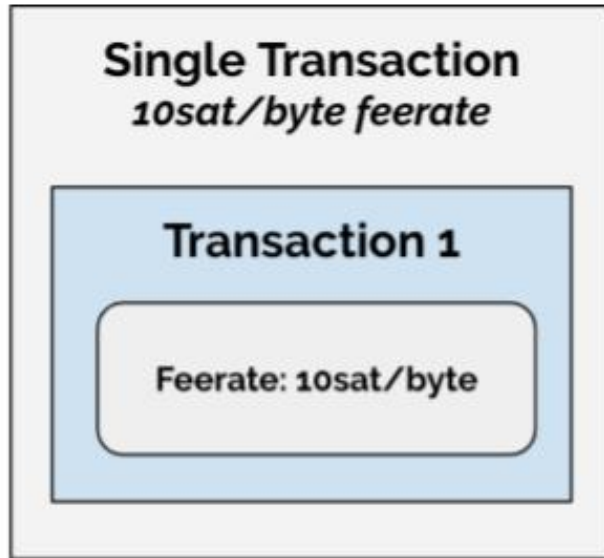



Replace by Fee





**Child Pays for Parent**





Receiving of 0.00100000B is queued

Time 09:56 Estimated arrival ~20m Queued 1800 In front of you 1793



The operation will soon be in the Blockchain.

RECEIVE FASTER >



Sending of 0.00080000B is queued

Time 12:07 Estimated arrival ~20m Queued 3311 In front of you 3266

The operation will soon be in the Blockchain.

SEND FASTER >

A blurred high-speed train in motion at a station platform. The train is white with a prominent red stripe running horizontally along its side. The background shows the station's ceiling with a grid of lights and the tiled floor of the platform. The overall image has a sense of speed and modern technology.

**Solutions -  
Coming Technology**

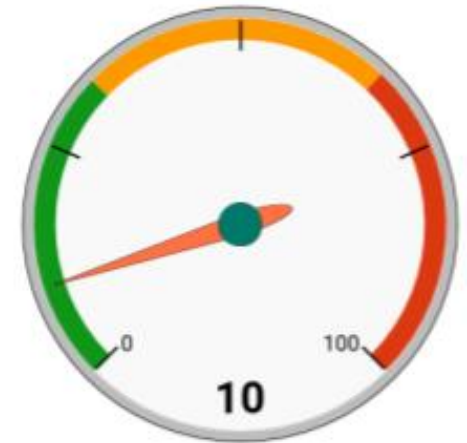
**Lightning**





# Solutions

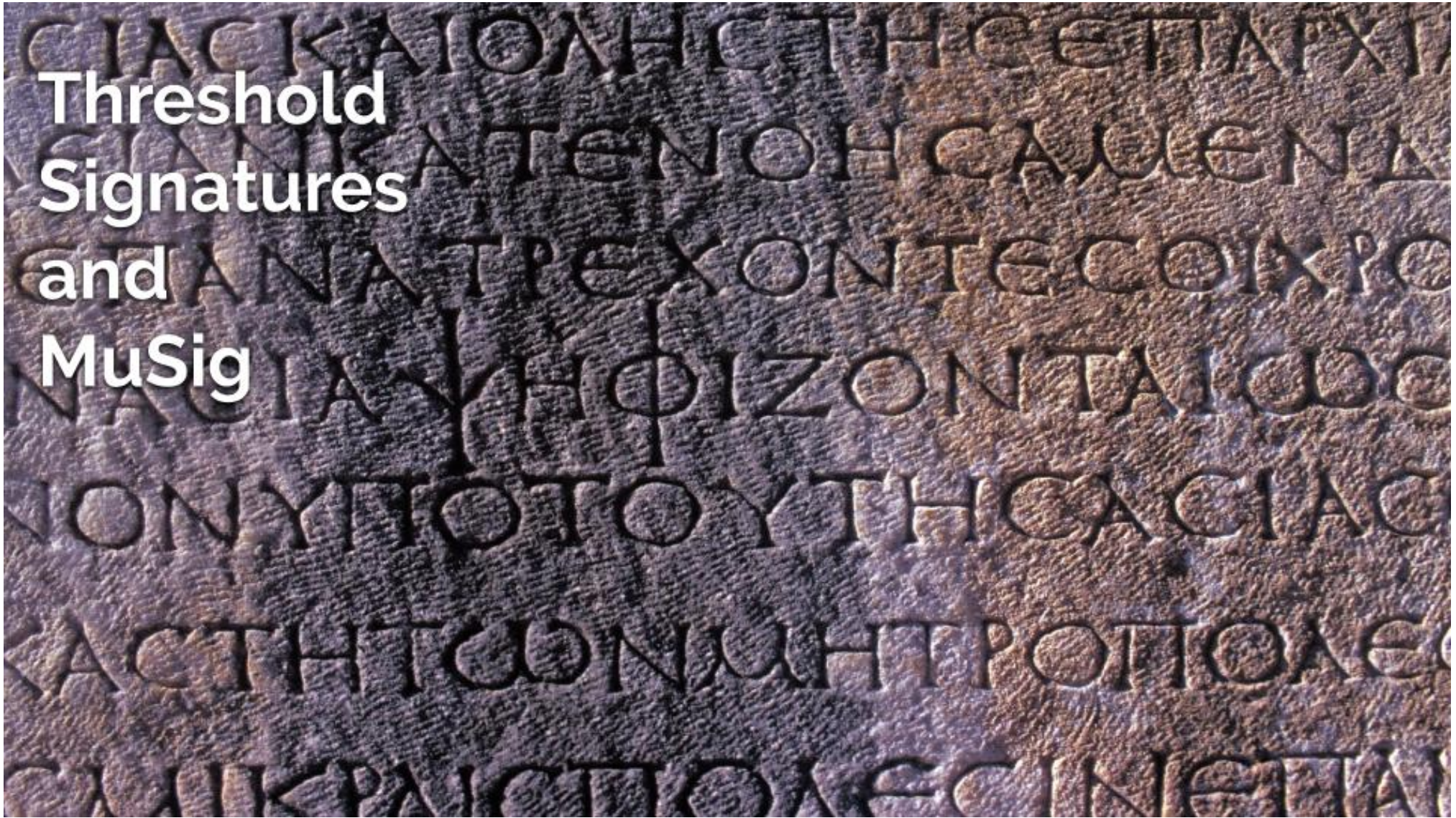
	Sustained Fees	Fee Spikes
Costs	<ul style="list-style-type: none"><li>• Payment Batching</li><li>• Segregated Witness</li><li>• Coin Selection</li></ul>	<ul style="list-style-type: none"><li>• Dynamic Fee Estimation</li><li>• Patient Spending</li><li>• UTXO Consolidation</li></ul>
Usability	<ul style="list-style-type: none"><li>• Lightning</li></ul>	<ul style="list-style-type: none"><li>• Child Pays for Parent (CPFP)</li><li>• Replace by Fee (RBF)</li></ul>





# Schnorr Signatures

**Threshold  
Signatures  
and  
MuSig**





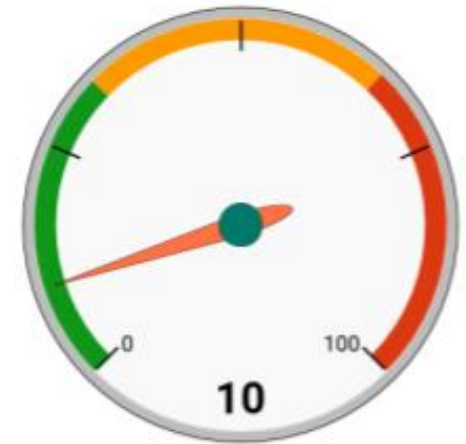
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# Education

# Solutions



	Sustained Fees	Fee Spikes
Costs	<ul style="list-style-type: none"><li>• Payment Batching</li><li>• Segregated Witness</li><li>• Coin Selection</li></ul>	<ul style="list-style-type: none"><li>• Dynamic Fee Estimation</li><li>• Patient Spending</li><li>• UTXO Consolidation</li></ul>
Usability	<ul style="list-style-type: none"><li>• User Education/Expectations</li><li>• Lightning</li></ul>	<ul style="list-style-type: none"><li>• Child Pays for Parent (CPFP)</li><li>• Replace by Fee (RBF)</li></ul>

# Summary

- Don't overpay tx fees
- Improve usability
- Set user expectations
- Adopt Lightning
- Utilize Optech

# Discussion

