

Gas Fees Across Chains

How transaction fees are priced on EVM chains, Solana, Bitcoin, and Dogecoin — the units, the mechanism, and the levers you actually control from a browser wallet.

The one-line idea

Every public chain has scarce block space. A fee is what you pay to occupy some of it. Chains differ in **what they meter** (computation, compute units, or bytes) and **how the price is set** (protocol formula versus open auction).

Side-by-side comparison

CHAIN	UNIT	METERED BY	PRICE SET BY
EVM (Ethereum, Base, Arbitrum)	Gwei = $1e-9$ ETH	Gas — per opcode, storage write, calldata byte	Protocol base fee (EIP-1559) + your priority tip
Solana (SVM)	Lamports = $1e-9$ SOL	Signatures + compute units (CU)	Fixed base fee per signature + optional prioritization fee
Bitcoin (UTXO)	sats/vByte	Transaction size in virtual bytes	Open mempool auction — miners take the top fee rates
Dogecoin	DOGE per kB / per byte	Transaction size in bytes	Miner relay policy + network load (usually very low)

Chain by chain

EVM chains — Ethereum, Base, Arbitrum

Unit: Gwei (1 Gwei = $1e-9$ ETH)

EIP-1559 splits the fee into a base fee that is burned and a priority fee that tips the block producer. Total cost = gas used $\times$ (base fee + priority fee). The base fee adjusts every block toward 50% block fullness.

What moves the fee

- Congestion — more pending transactions push the base fee up block by block.
- Contract complexity — loops, SSTOREs, and cold SLOADs all consume more gas.
- Gas limit — the ceiling you authorise; unused gas is refunded, an under-estimate reverts out of gas.

Wallet tip. In MetaMask, open Advanced on the gas step and compare slow / market / aggressive. Only the priority fee changes; the base fee is the same for everyone in that block.

Solana (SVM)

Unit: Lamports (1 SOL = 1e9 lamports)

Solana charges a small fixed base fee per signature, plus an optional prioritization fee that buys scheduling preference for your requested compute-unit budget. Fees are typically flat and a tiny fraction of a cent.

What moves the fee

- Compute units — every instruction consumes a measured CU amount against the transaction budget.
- Signature count — each additional signer adds base fee.
- Prioritization fee — a per-CU price you set to jump the queue during hot mints.

Wallet tip. Phantom's transaction preview shows the CU budget and the priority fee. Fees are always paid in SOL, even when moving SPL tokens.

Bitcoin (UTXO)

Unit: sats/vByte (satoshis per virtual byte)

There is no gas metering — miners simply pick the highest fee rate per byte. Total fee = size in vBytes x fee rate. Because each spent UTXO adds input bytes, a wallet full of dust is expensive to move.

What moves the fee

- Transaction size — more inputs and outputs mean more vBytes.
- Mempool demand — the competitive fee rate rises when blocks stay full.
- Address type — SegWit and Taproot inputs are smaller than legacy P2PKH.

Wallet tip. In Unisat or Xverse, set a custom sats/vByte rate. A 1-in / 1-out SegWit tx is roughly 140 vBytes; a 10-input legacy tx can exceed 1,000 vBytes.

Dogecoin

Unit: DOGE per kilobyte (or per byte in modern explorers)

Dogecoin inherited Bitcoin's size-based model but with different default relay rules and far lower typical rates, so most wallets quote a flat fee that comfortably clears the minimum.

What moves the fee

- Transaction size in bytes — the same UTXO input/output arithmetic as Bitcoin.
- Minimum relay fee — the node-level floor, lower than Bitcoin's.
- Miner policy — pools set their own acceptance threshold.

Wallet tip. MyDoge usually quotes one flat number. Divide it by the transaction's byte size to see the implied rate and judge whether you are over-paying.

Estimating before you sign

```
EVM      cost_eth  = gasUsed * (baseFee + priorityFee) / 1e18
Solana    cost_sol  = (5000 * signatures + priorityFee * CU) / 1e9
Bitcoin   cost_sats = vBytes * feeRate
Doge      cost_doge = ceil(bytes / 1000) * feePerKb
```

Beginner mistakes

- Thinking the fee pays for the token amount — it pays for block space, independent of value moved.
- Sending an ERC-20 or SPL token with zero native balance: you still need ETH or SOL for the fee.
- Raising the gas limit to make a transaction faster. Speed comes from the priority fee.
- Consolidating dust on Bitcoin at peak fee rates instead of during a quiet weekend.
- Replacing a stuck EVM transaction with a lower nonce or lower tip, which never replaces it.

Exercise

- Open a block explorer for Base Sepolia and record the base fee now versus one hour later.
- Estimate the cost of stake() in the SolForge staking lab, then compare to the actual receipt.
- Look up one Bitcoin transaction and compute its sats/vByte from size and fee.