

Ethereum Data Locations

Storage

Persistent (on-chain)

Expensive to write

~20,000 gas per slot

State variables

Key-value store

Memory

Temporary (per call)

Cheaper than storage

~3 gas per word

Function variables

Linear byte array

Calldata

Read-only input

Cheapest option

~3 gas per byte

Function arguments

Immutable

Gas Cost Comparison (approximate)

Storage write (new):

~20,000 gas

Storage write (update):

~5,000 gas

Memory expansion:

~3 gas/word

Calldata read:

~3 gas/byte

Best Practice: Use calldata for read-only, memory for temp, storage only when needed