

Experiment No : 1

Title: Installation of Metamask and Study Spending Ether per Transaction

Aim:

To install the MetaMask wallet extension and perform a series of Ethereum transactions to observe and analyze the spending of Ether (ETH) per transaction.

Requirements:

Computer with a web browser (Chrome or Firefox)

Internet connection

Ethereum (ETH)

Objective:

Install the MetaMask wallet extension on the web browser.

Add Ether to the MetaMask wallet.

Conduct multiple Ethereum transactions while varying transaction amounts and gas fees.

Record and analyze the Ether spent on gas fees for each transaction.

Understand the factors affecting gas fees on the Ethereum network.

Theory:

MetaMask is a popular Ethereum wallet and browser extension that allows users to manage their Ether holdings and interact with Ethereum-based applications (DApps). Ethereum transactions involve sending Ether from one address to another, and these transactions require a fee, known as gas, to be processed on the Ethereum network.

Gas fees are essential for Ethereum's functionality as they incentivize miners to validate and include transactions in the blockchain. The amount of Ether spent on gas fees depends on several factors:

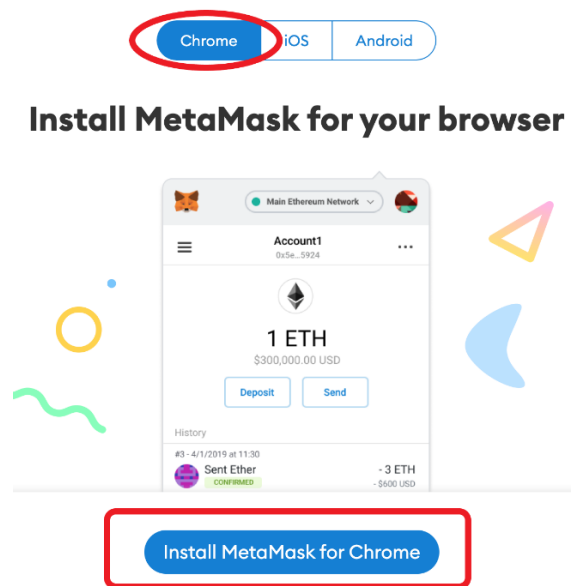
Gas Price (Gwei): Gas price is the price per unit of gas, measured in Gwei (1 Ether = 1,000,000,000 Gwei). A higher gas price results in faster transaction processing but higher fees.

Gas Limit: The gas limit is the maximum amount of gas you are willing to spend on a transaction. It accounts for the computational complexity of the transaction. More complex transactions require higher gas limits.

Network Congestion: During times of high demand on the Ethereum network, gas prices may increase due to competition for block space. Low network congestion typically results in lower gas fees.

Procedure:

1) Install the MetaMask Wallet Extension:



MetaMask is a browser extension that acts as an Ethereum wallet, enabling users to interact with Ethereum-based applications (DApps) and manage their Ether holdings.

Begin by opening your preferred web browser (Google Chrome or Mozilla Firefox).

Navigate to the official MetaMask website by typing "<https://metamask.io/>" into your browser's address bar.

Once on the MetaMask website, you will find options for different browsers. Click on "Get Chrome Extension" if you are using Chrome or "Get Firefox Extension" if you are using Firefox.

Follow the installation instructions provided by your browser to add the MetaMask extension.

During the installation process, you will be prompted to create a password and generate a secret backup phrase. This backup phrase is crucial for recovering your wallet if you lose access to it. Store it in a safe place and do not share it with anyone.

Studying spending Ether per transaction on the Ethereum blockchain involves understanding how transaction costs are calculated and managed. Here's a detailed step-by-step guide to help you understand the process:

1. **Understand Gas:** In Ethereum, all transactions and smart contract executions require computational resources, such as CPU and memory. Gas is a unit of measurement for these computational resources. Each operation in a transaction consumes a certain amount of gas.



2. **Gas Price:** Gas Price is the amount of Ether (ETH) you are willing to pay per unit of gas. It is usually denominated in Gwei, which is a subunit of ETH. You set the gas price when creating a transaction, and it determines how quickly your transaction will be processed by miners. Higher gas prices lead to faster confirmations, while lower prices may result in slower confirmations.

From:	0x95222290DD7278Aa3Ddd389Cc1E1d165CC4BAfe5 (beaverbuild)
To:	0x9c595f9518b11b2876B2A5E89996B1Fd2c748726
Value:	4.029691476938594566 ETH (\$6,488.23)
Transaction Fee:	0.00022401603147 ETH (\$0.36)
Gas Price:	10.66743007 Gwei (0.00000001066743007 ETH)

3. **Gas Limit:** Gas Limit is the maximum amount of gas you are willing to consume in a transaction. It is set by the sender when creating a transaction and is a critical factor in determining the total cost of the transaction. If a transaction's operations require more gas than the Gas Limit, the transaction will fail.

Gas Limit & Usage by Txn:	32,000 21,000 (65.63%)
Gas Fees:	Base: 10.66743007 Gwei Max: 10.66743007 Gwei Max Priority: 0 ETH

4. Calculation of Transaction Cost:

- The total transaction cost is calculated as Gas Price (in Gwei) multiplied by Gas Limit (the maximum gas usage).
- Transaction Cost (in ETH) = Gas Price (in Gwei) * Gas Limit / 1,000,000,000 (to convert from Gwei to ETH).

5. Estimating Transaction Costs: Before sending a transaction, it's a good practice to estimate the transaction cost to ensure you're comfortable with the fee. You can use online calculators or wallet interfaces to get an idea of the current gas prices and set an appropriate Gas Price and Gas Limit based on your needs.

6. Sending a Transaction:

- When you create and sign a transaction, you specify the recipient, amount, Gas Price, and Gas Limit.
- Once you broadcast the transaction to the Ethereum network, miners pick it up and include it in a block.

7. Confirmation Time: The time it takes for a transaction to be confirmed depends on the Gas Price you set. Miners prioritize transactions with higher gas prices, so a higher gas price will result in faster confirmation.

8. Transaction Cost Variability: Gas Prices can vary greatly based on network congestion. During periods of high activity, gas prices may spike. It's essential to monitor the network's current conditions and adjust your gas price accordingly.

9. Gas Refunds: If your transaction consumes less gas than the Gas Limit you set, you will receive a gas refund for the unused gas. This can reduce the overall transaction cost.

10. Monitoring and Analysis: After your transaction is confirmed, you can view the details on an Ethereum block explorer, such as Etherscan. This allows you to see the Gas Used (actual gas consumption) and the final cost of the transaction.

The screenshot displays the Etherscan interface for a transaction. At the top, there's a navigation bar with links to Home, Blockchain, Tokens, NFTs, Resources, Developers, and More, along with a Sign In button. Below this, the 'Transaction Details' section is active, showing tabs for Overview, State, and Comments. A sponsored banner for 'bc.game' is visible. The transaction details include: Transaction Hash (0xe98beca8e32b679d7bc56525502c37b8fa9510306b763f12541fcd8a453ae3), Status (Success), Block (18390569, 4 Block Confirmations), and Timestamp (47 secs ago, Oct-20-2023 09:13:35 AM +UTC). The Transaction Action is a transfer of 4.029691476938594566 ETH to the address 0x9c595f...2c748726.

11. Best Practices:

- Use online tools or wallet interfaces to monitor current gas prices and trends.
- Set reasonable Gas Prices and Gas Limits to ensure your transactions are processed in a timely and cost-effective manner.
- Be aware that complex smart contracts or interactions with decentralized applications (dApps) may require more gas.

Studying and managing spending Ether per transaction effectively involves understanding gas, staying informed about network conditions, and making informed decisions when creating transactions. By following these steps and best practices, you can control your transaction costs on the Ethereum blockchain.

Conclusion:

Summarize your findings and insights based on the data you collected during the experiment.

Reflect on the implications of gas fees in terms of transaction cost, speed, and usability of the Ethereum network and DApps.