MIT World Peace University

Blockchain Technology
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Exploring Go Ethereum (Geth)

Lab Assignment 5

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1 Objective

This document provides a comprehensive guide to installing, configuring, and using the Geth (Go Ethereum) client to interact with the Ethereum blockchain. It covers system requirements, installation steps, account management, and network interaction.

2 Theory

2.1 What is Geth?

Geth (Go Ethereum) is an official Ethereum client implemented in the Go programming language. It allows users to run a full Ethereum node, mine Ether, deploy smart contracts, and interact with the Ethereum network.

2.2 Why Use Geth?

Geth is widely used for:

- Running a full Ethereum node to participate in the blockchain network.
- Developing and testing Ethereum smart contracts.
- Managing Ethereum accounts and sending transactions.
- Deploying private Ethereum networks for development.

2.3 Synchronization Modes in Geth

Geth offers different synchronization modes to connect with the Ethereum blockchain:

- **Full Sync:** Downloads the entire blockchain and verifies all transactions.
- **Fast Sync:** Downloads only recent state data while verifying historical blocks.
- **Light Sync:** Downloads minimal blockchain data and relies on full nodes for queries.

3 FAQs

1. **What are the system requirements for running the Geth client?**

   The minimum recommended system requirements for running Geth effectively are:

   - **Processor:** Dual-core CPU (Quad-core recommended)
   - **RAM:** 4GB (8GB or more recommended)
   - **Storage:** At least 500GB SSD (Blockchain grows over time)
   - **Operating System:** Windows, macOS, or Linux
   - **Internet Connection:** Stable broadband connection for syncing

2. **How do you install the Geth client on your system?**

   The installation process depends on the operating system:

   On Windows:

(a) Download Geth from Geth's official website.

(b) Run the installer and follow the setup instructions.

(c) Open Command Prompt and type `geth version` to verify the installation.

On macOS:

(a) Install Homebrew if not already installed:

(b) Install Geth using Homebrew: `brew tap ethereum/ethereum brew install ethereum`

(c) Verify installation: `geth version`

On Linux:

(a) Download Geth from the official website or install using the package manager:

- Ubuntu/Debian: `sudo apt install geth`
- Arch Linux: `sudo pacman -S geth`

(b) Verify installation: `geth version`

3. **How do you initiate Geth to sync with the Ethereum blockchain?**

   To start syncing with the Ethereum blockchain, use the following command:

   - **Fast Sync:** `geth -syncmode "fast"`
   - **Full Sync:** `geth -syncmode "full"`
   - **Light Sync:** `geth -syncmode "light"`

   Geth will start downloading blocks and updating the blockchain state.

4. **How do you create and manage an Ethereum account using Geth?**

   To create a new Ethereum account:

   (a) Open a terminal and run: `geth account new`

   (b) Enter a secure passphrase when prompted.

   (c) Geth generates a new account and returns an Ethereum address.

   To list all existing accounts: `geth account list`

   To unlock an account for transactions: `geth -unlock <account-address> -password <password-file>`

5. **How do you interact with the Ethereum network after setting up Geth?**

   Once Geth is running and synced, users can:

   - Send transactions: `eth.sendTransaction(from: "0xYourAddress", to: "0xRecipientAddress", value: web3.toWei(1, "ether"))`
   - Check account balance: `eth.getBalance("0xYourAddress")`
   - Deploy and interact with smart contracts.

4 Glossary

- **Ethereum:** A decentralized blockchain network that supports smart contracts.
- **Geth:** The Go Ethereum client used to run Ethereum nodes and interact with the blockchain.
- **Full Node:** A node that maintains the entire Ethereum blockchain history.
- **Light Node:** A node that downloads only block headers and relies on full nodes for queries.
- **Sync Mode:** The mode in which a node synchronizes with the Ethereum network (Full, Fast, or Light).
- **Private Key:** A secret key used to sign transactions and prove ownership of an Ethereum account.
- **Gas:** A measure of computational work required for Ethereum transactions and smart contract executions.
- **Web3.js:** A JavaScript library used to interact with the Ethereum blockchain.

References

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