

Experiment No.2

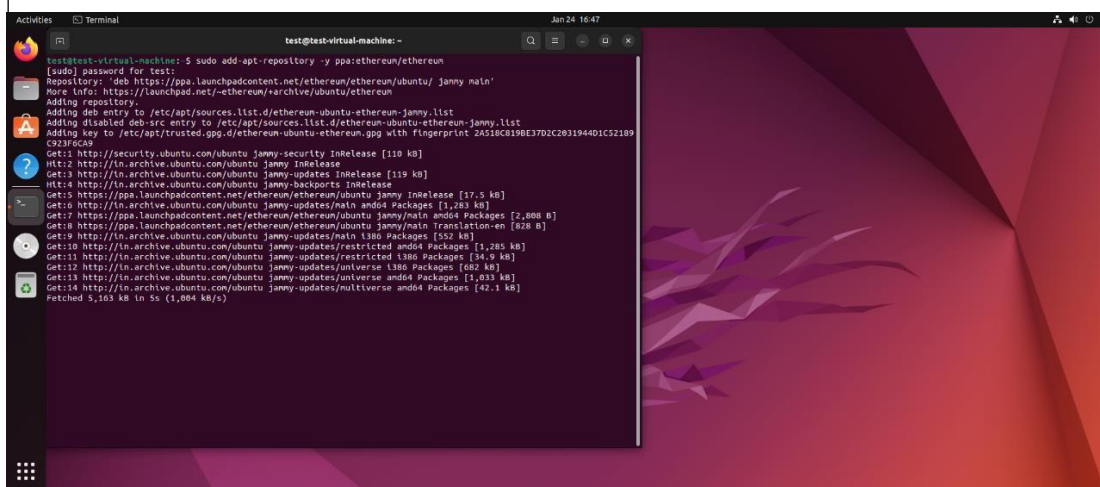
Aim: To install Geth on machines to understand the basics of blockchain technology.

Geth is an official command-line interface (CLI) tool that is used to run an Ethereum node with the Go programming language it's a short form of "Go Ethereum". It serves as a client for the Ethereum blockchain and is one of the three original implementations (along with C++ and Python) of the Ethereum protocol. Being an essential part of the Ethereum network, Geth allows users to mine Ether, transfer funds between addresses, create smart contracts, and explore block history.

Steps:

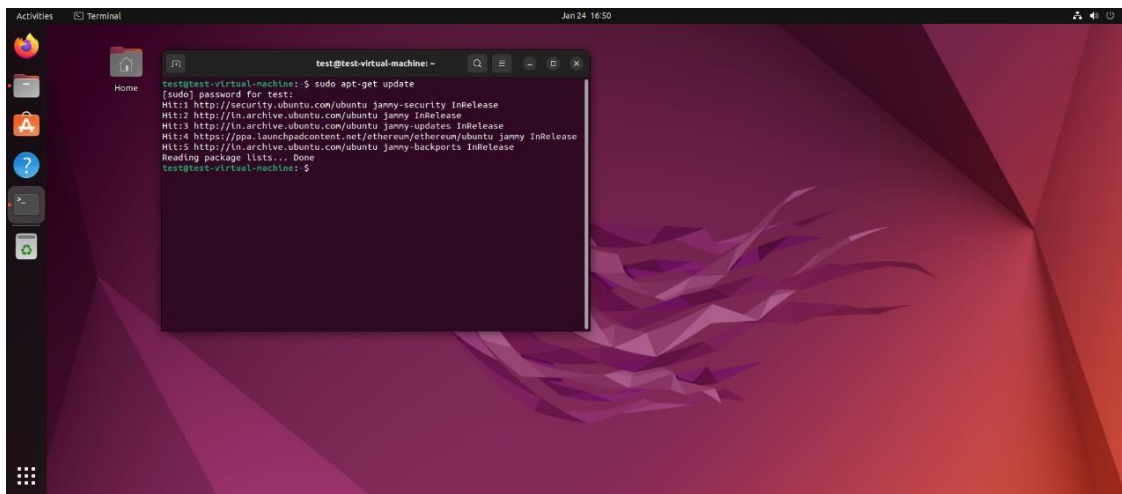
1. **Open a Terminal Window:** First, open a terminal window on your Ubuntu system. You can do this by searching for "Terminal" in your applications menu or by pressing Ctrl + Alt + T on your keyboard.
2. **Add the Ethereum PPA (Personal Package Archive):** Ethereum provides a PPA to make it easy to install Geth. You can add this PPA to your system with the following command.

```
sudo add-apt-repository -y ppa:ethereum/ethereum
```



3. **Update the Package List:** After adding the PPA, update your package list to ensure your system knows about the packages available in the newly added repository.

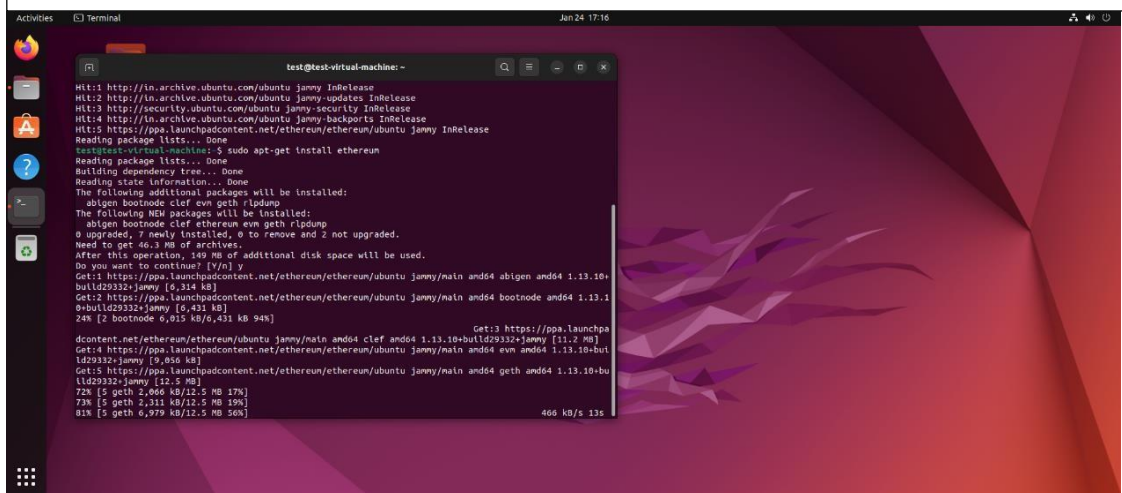
```
sudo apt-get update
```



```
test@test-virtual-machine:~$ sudo apt-get update
[sudo] password for test:
Hit:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Hit:2 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Hit:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:4 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu jammy InRelease
Hit:5 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Reading package lists... Done
test@test-virtual-machine:~$
```

4. **Install Geth:** Now, you can install Geth using the following command.

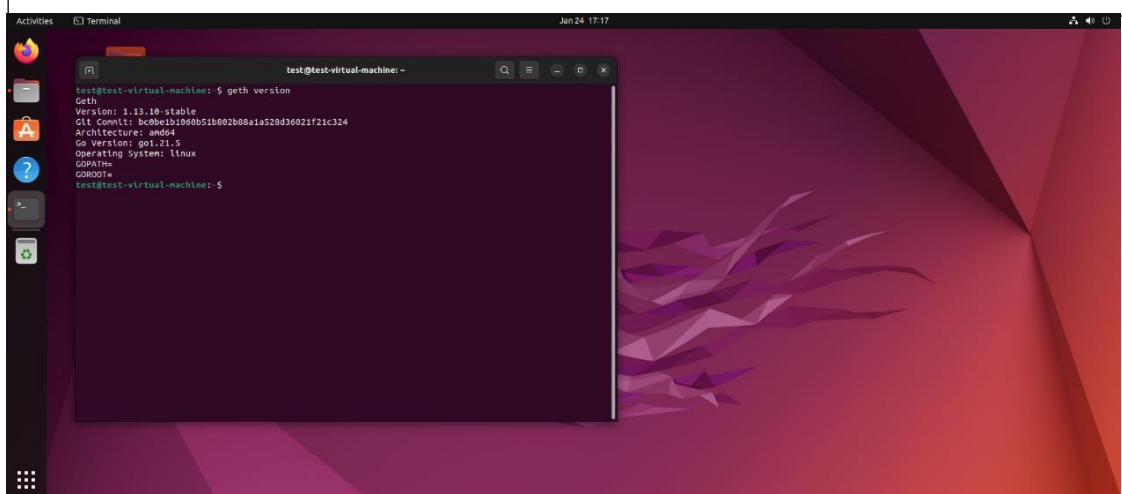
sudo apt-get install Ethereum



```
test@test-virtual-machine:~$ sudo apt-get install ethereum
Hit:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://security.ubuntu.com/ubuntu jammy-security InRelease
Hit:4 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:5 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu jammy InRelease
Reading package lists... Done
test@test-virtual-machine:~$ sudo apt-get install ethereum
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  abigen bootnode clef evm geth ripemd
The following NEW packages will be installed:
  abigen bootnode clef ethereum evm geth ripdump
0 upgraded, 7 newly installed, 0 to remove and 2 not upgraded.
Need to get 46.3 MB of archives.
After this operation, 149 MB of additional disk space will be used.
Get:1 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu jammy/main amd64 1.13.10-
bulld29332-jammy [6,314 kB]
Get:2 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu jammy/main amd64 bootnode amd64 1.13.1
0-bulld29332-jammy [6,431 kB]
24% [2 bootnode 6,015 KB/6,431 KB 94%] Get:3 https://ppa.launchpa
dcontent.net/ethereum/ethereum/ubuntu jammy/main amd64 clef amd64 1.13.10-bulld29332-jammy [11.2 MB]
Get:4 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu jammy/main amd64 evm amd64 1.13.10-bu
ld29332-jammy [9,050 kB]
Get:5 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu jammy/main amd64 geth amd64 1.13.10-bu
ld29332-jammy [12.5 MB]
72% [5 geth 2,804 KB/12.5 MB 17%]
73% [5 geth 2,313 KB/12.5 MB 19%]
81% [5 geth 6,979 KB/12.5 MB 56%]
466 kB/s 13s
```

5. **Verify the Installation:** Once the installation process is complete, you can verify that Geth has been installed correctly by checking its version with the following command.

geth version



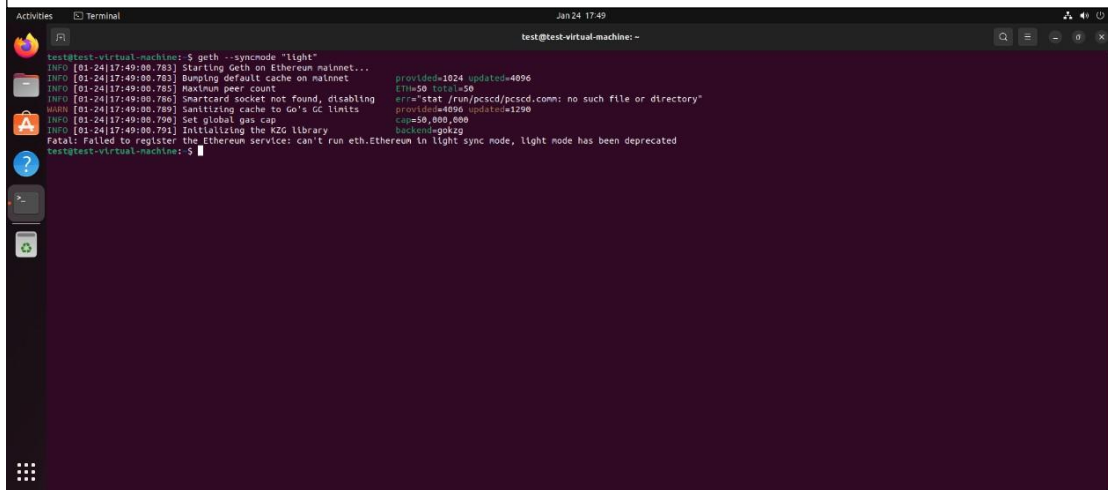
```
test@test-virtual-machine:~$ geth version
Geth
Version: 1.13.10-stable
Git Commit: bc0be1b090b51b002b0a1a520d36021f21c324
Architecture: amd64
Go Version: go1.21.5
Operating System: linux
GOPATH=
GOROOT=
test@test-virtual-machine:~$
```

6. **Run Geth:** To start running a Geth node that connects to the Ethereum network, you can simply run.

Geth

7. **Synchronization:** Geth offers several synchronization modes. The default mode is "fast", but you can specify a different mode using the `--syncmode` flag. For example, to start Geth in light mode, which requires less disk space.

```
geth --syncmode "light"
```



Testing Geth

Testnet Steps: 'Ropsten' is crucial testnet for developers, as it provides an environment that mimics/ simulates the Ethereum mainnet but uses free, valueless Ether for testing purposes. This allows developers to deploy and test their smart contracts and applications without risking real money.

Example Use:

- A. **Start Geth in goerli Testnet Mode:** To connect to the Ropsten testnet using goerli, you need to start Geth with specific flags that tell it to connect to goerli instead of the main Ethereum network. Use the following command:

```
geth --goerli --syncmode "full" --http --http.api "eth,net,web3,personal"
```

- B. **Wait for Synchronization:** After running the command, Geth will start synchronizing the Gerli blockchain. This process can take some time, depending on your internet connection and the chosen sync mode. Geth needs to download the entire blockchain to be fully operational.



```
test@test-virtual-machine:~$ geth --goerli --syncmode "full" --http --http.api "eth,net,web3,personal"
INFO [01-24|17:59:17.054] "Starting Geth on Goerli testnet..."
INFO [01-24|17:59:17.065] Maximal peer count: 25
INFO [01-24|17:59:17.067] Smartcard socket not found, disabling
INFO [01-24|17:59:17.065] Set global gas cap: 50,000,000
INFO [01-24|17:59:17.066] Initializing the KZG library
INFO [01-24|17:59:17.110] Allocated trie memory caches: clean=154.00MiB dirty=256.00MiB
INFO [01-24|17:59:17.151] defaulting to pebble as the backing database
INFO [01-24|17:59:17.153] Allocated cache and file handles
INFO [01-24|17:59:17.164] Opened ancient database
INFO [01-24|17:59:17.164] State schema set to default
INFO [01-24|17:59:17.164] Initialising Ethereum protocol
INFO [01-24|17:59:17.166] Writing custom genesis block
INFO [01-24|17:59:17.184] Persisted trie from memory database
INFO [01-24|17:59:17.190] Chain ID: 5 (goerli)
INFO [01-24|17:59:17.190] Consensus: Beacon (proof-of-stake), merged from Clique (proof-of-authority)
INFO [01-24|17:59:17.190] Pre-Merge hard forks (block based):
INFO [01-24|17:59:17.190] - Homestead: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/homestead.md)
INFO [01-24|17:59:17.190] - Tangerine Whistle (EIP 150): #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/tangerine-whistle.md)
INFO [01-24|17:59:17.190] - Spurious Dragon 1 (EIP 155): #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/spurious-dragon.md)
INFO [01-24|17:59:17.190] - Spurious Dragon 2 (EIP 158): #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/spurious-dragon.md)
INFO [01-24|17:59:17.190] - Byzantium: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/byzantium.md)
INFO [01-24|17:59:17.190] - Constantinople: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/constantinople.md)
INFO [01-24|17:59:17.190] - Petersburg: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/petersburg.md)
INFO [01-24|17:59:17.190] - Istanbul: #361053 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/istanbul.md)
INFO [01-24|17:59:17.190] - Berlin: #460684 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/berlin.md)
INFO [01-24|17:59:17.190] - London: #5062603 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/london.md)
INFO [01-24|17:59:17.190] Merge configured:
INFO [01-24|17:59:17.190] - Hard-fork specification: https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/paris.md
INFO [01-24|17:59:17.190] - Network known to be merged: true
INFO [01-24|17:59:17.190] - Total terminal difficulty: 16790000
INFO [01-24|17:59:17.190] Post-Merge hard forks (timestamp based):
INFO [01-24|17:59:17.190] - Shanghai: @167883736 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/shanghai.md)
INFO [01-24|17:59:17.190] - Cancun: @1705473120
INFO [01-24|17:59:17.190]
INFO [01-24|17:59:17.190]
INFO [01-24|17:59:17.190]
```

- C. **Interact with Geth:** Once the synchronization is complete, you can start interacting with Geth and the Ropsten testnet. You can use the Geth JavaScript console to directly interact with the network by opening another terminal window and running.

`geth attach http://127.0.0.1:8545`

```
test@test-virtual-machine:~$ geth attach http://127.0.0.1:8545
WARN [01-24|18:01:51.954] Enabling deprecated personal namespace
Welcome to the Geth JavaScript console!

Instance: Geth/v1.13.10-stable-bc0be1b1/linux-amd64/go1.21.5
at block: 0 (Wed Jan 30 2019 18:50:31 GMT+0530 (IST))
modules: eth:1.0 net:1.0 personal:1.0 rpc:1.0 web3:1.0

To exit, press ctrl-d or type exit
>
```

- D. **Obtain Test Ether:** To conduct transactions on the Ropsten testnet, you'll need test Ether. You can obtain it from a Ropsten faucet, which distributes free test Ether. Search for "Ropsten faucet" online and follow the instructions on the website to receive your test, Ether.
- E. **Perform Transactions:** With test Ether in your account, you can start deploying contracts, making transactions, or testing your applications without spending real Ether.