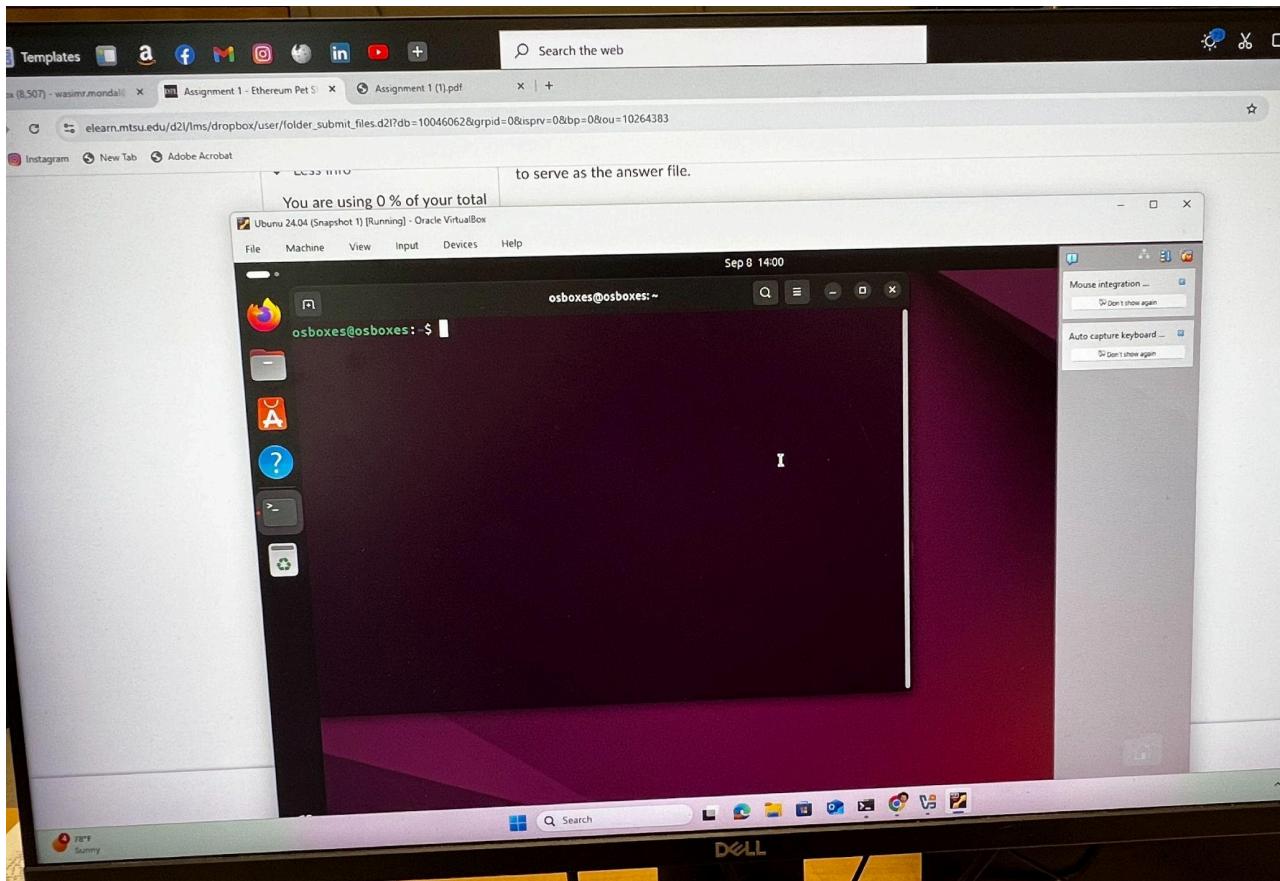


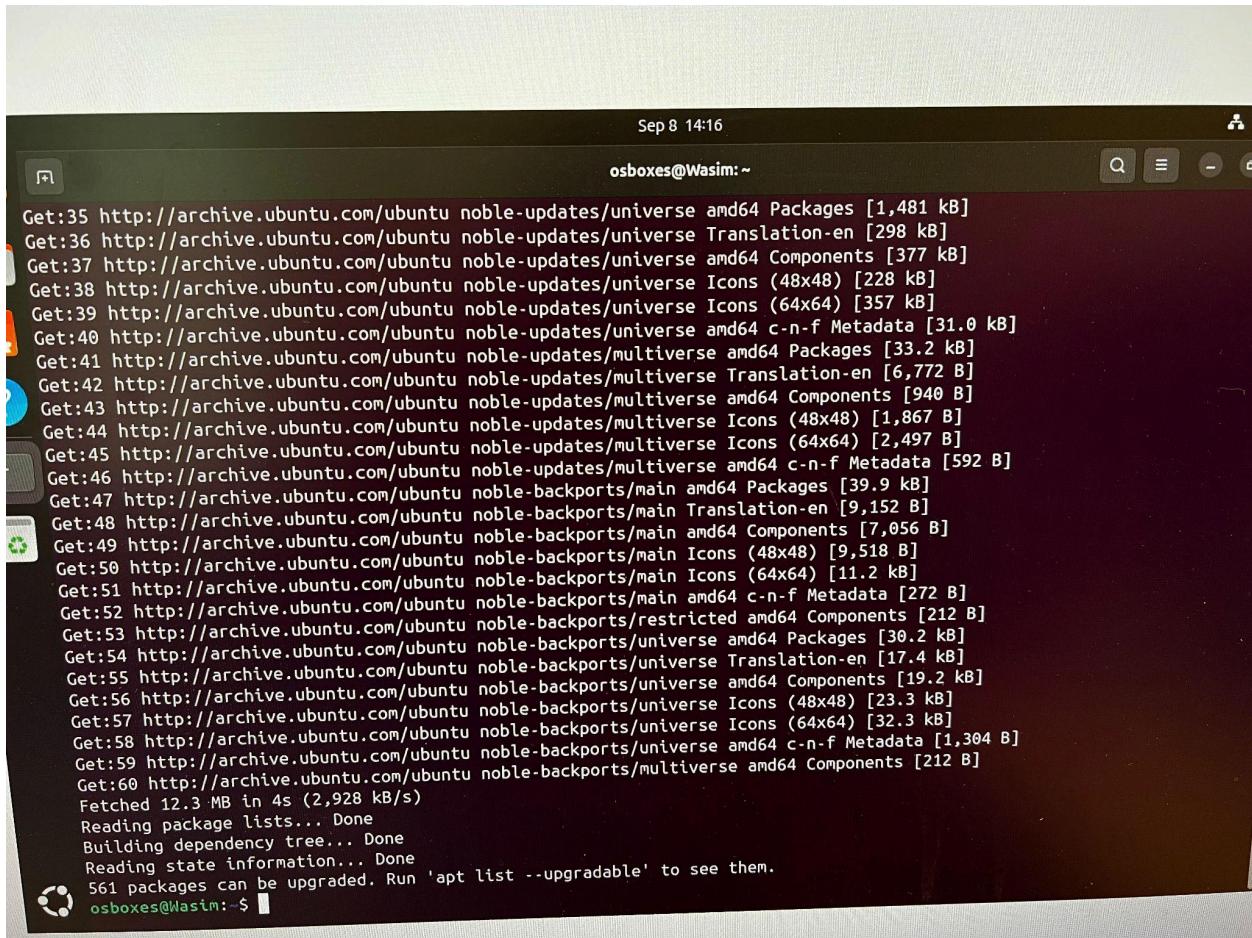
Blockchain and Smart Contracts  
CSCI 5450  
Assignment1:Ethereum Pet Shop Tutorial  
WASIM RAJA MONDAL

Setup the virtual machine environment

I am following instructions for Windows PCs



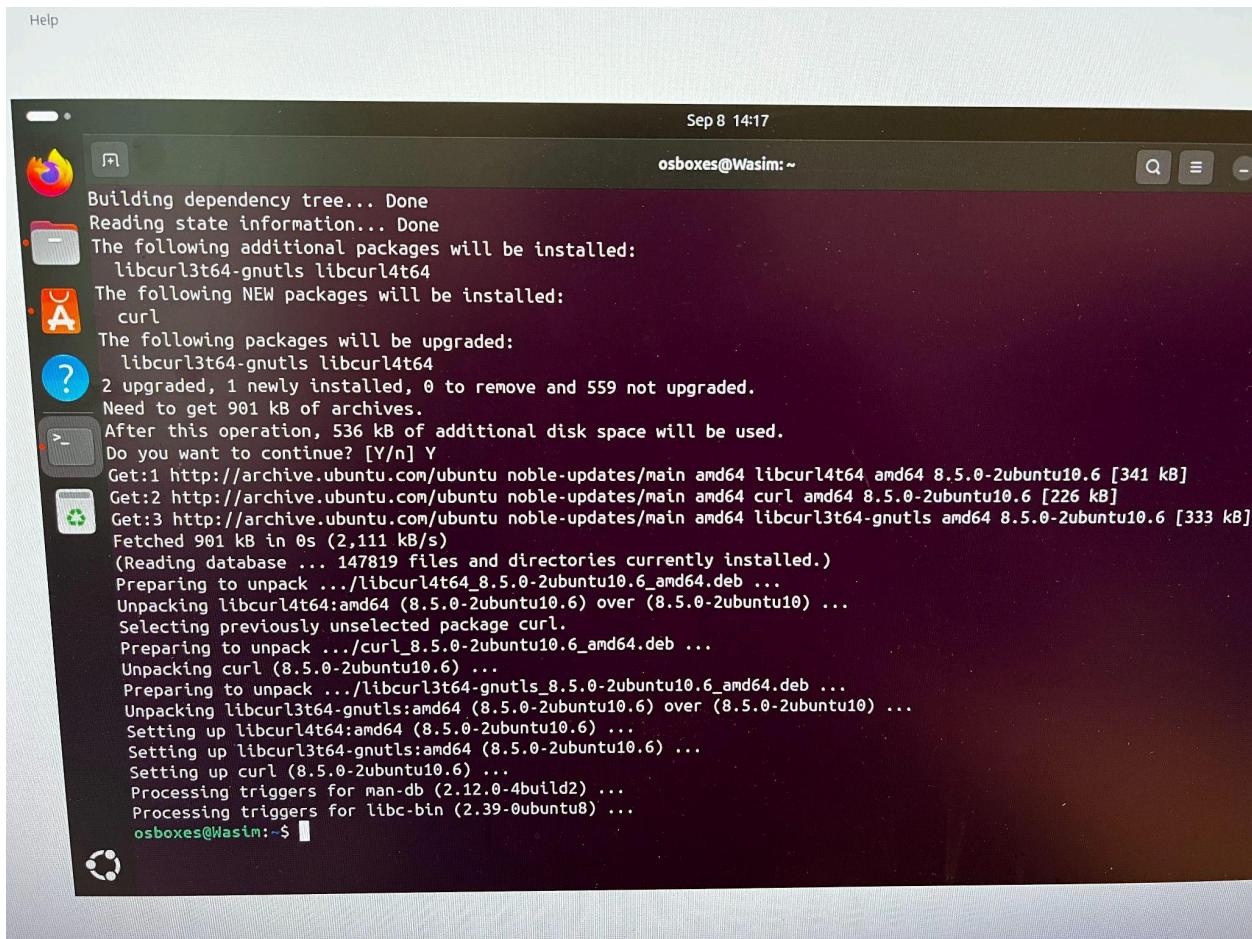
## Setting up the development environment in Ubuntu VirtualBox



Sep 8 14:16  
osboxes@Wasim:~

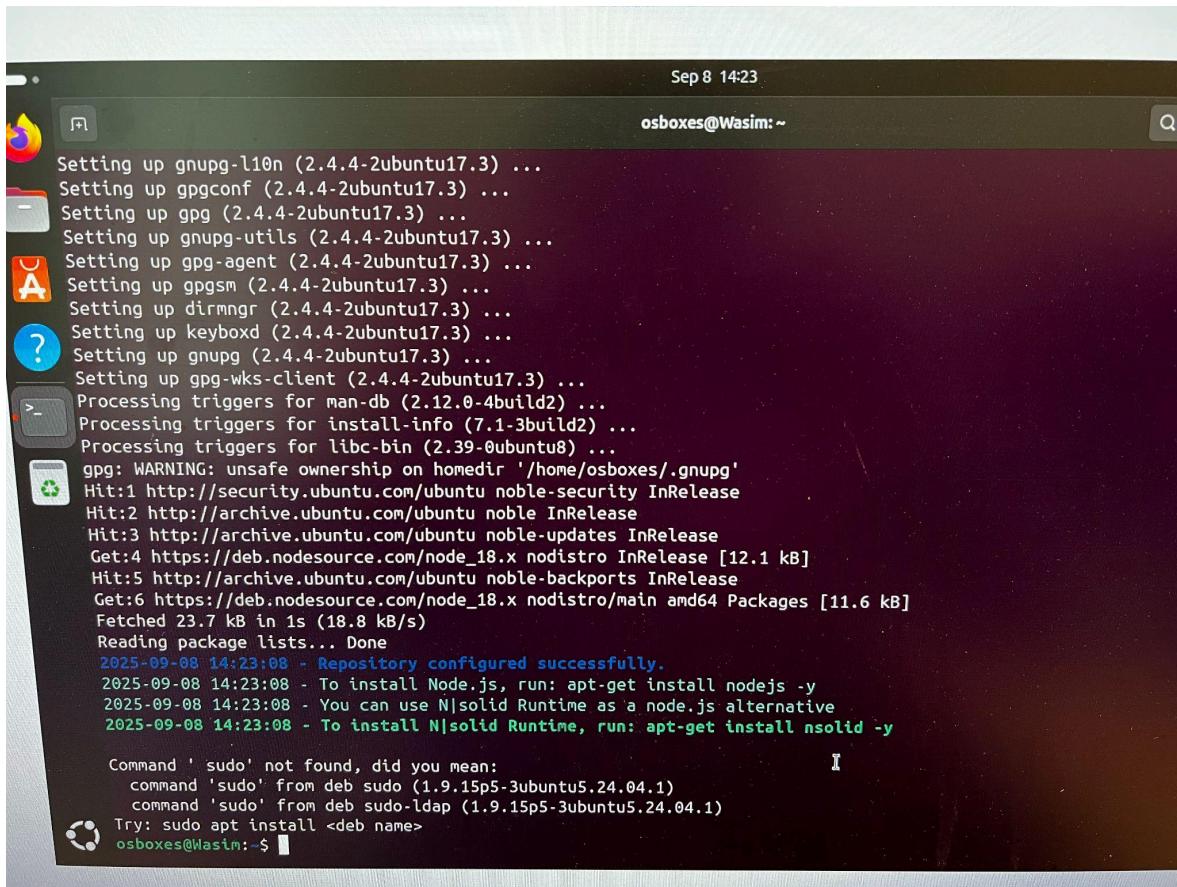
```
Get:35 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1,481 kB]
Get:36 http://archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [298 kB]
Get:37 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [377 kB]
Get:38 http://archive.ubuntu.com/ubuntu noble-updates/universe Icons (48x48) [228 kB]
Get:39 http://archive.ubuntu.com/ubuntu noble-updates/universe Icons (64x64) [357 kB]
Get:40 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f Metadata [31.0 kB]
Get:41 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [33.2 kB]
Get:42 http://archive.ubuntu.com/ubuntu noble-updates/multiverse Translation-en [6,772 B]
Get:43 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:44 http://archive.ubuntu.com/ubuntu noble-updates/multiverse Icons (48x48) [1,867 B]
Get:45 http://archive.ubuntu.com/ubuntu noble-updates/multiverse Icons (64x64) [2,497 B]
Get:46 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 c-n-f Metadata [592 B]
Get:47 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 Packages [39.9 kB]
Get:48 http://archive.ubuntu.com/ubuntu noble-backports/main Translation-en [9,152 B]
Get:49 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7,056 B]
Get:50 http://archive.ubuntu.com/ubuntu noble-backports/main Icons (48x48) [9,518 B]
Get:51 http://archive.ubuntu.com/ubuntu noble-backports/main Icons (64x64) [11.2 kB]
Get:52 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 c-n-f Metadata [272 B]
Get:53 http://archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [212 B]
Get:54 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Packages [30.2 kB]
Get:55 http://archive.ubuntu.com/ubuntu noble-backports/universe Translation-en [17.4 kB]
Get:56 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [19.2 kB]
Get:57 http://archive.ubuntu.com/ubuntu noble-backports/universe Icons (48x48) [23.3 kB]
Get:58 http://archive.ubuntu.com/ubuntu noble-backports/universe Icons (64x64) [32.3 kB]
Get:59 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 c-n-f Metadata [1,304 B]
Get:60 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Fetched 12.3 MB in 4s (2,928 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
561 packages can be upgraded. Run 'apt list --upgradable' to see them.
osboxes@Wasim: $
```

## Install nodejs and node package manager



A screenshot of a terminal window on an Ubuntu desktop environment. The terminal shows the output of an apt-get update and upgrade command. The window title bar says "osboxes@Wasim: ~". The terminal window has a dark background with light-colored text. It displays the following command and its execution:

```
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libcurl3t64-gnutls libcurl4t64
The following NEW packages will be installed:
  curl
The following packages will be upgraded:
  libcurl3t64-gnutls libcurl4t64
2 upgraded, 1 newly installed, 0 to remove and 559 not upgraded.
Need to get 901 kB of archives.
After this operation, 536 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl4t64 amd64 8.5.0-2ubuntu10.6 [341 kB]
Get:2 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 curl amd64 8.5.0-2ubuntu10.6 [226 kB]
Get:3 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl3t64-gnutls amd64 8.5.0-2ubuntu10.6 [333 kB]
Fetched 901 kB in 0s (2,111 kB/s)
(Reading database ... 147819 files and directories currently installed.)
Preparing to unpack .../libcurl4t64_8.5.0-2ubuntu10.6_amd64.deb ...
Unpacking libcurl4t64:amd64 (8.5.0-2ubuntu10.6) over (8.5.0-2ubuntu10) ...
Selecting previously unselected package curl.
Preparing to unpack .../curl_8.5.0-2ubuntu10.6_amd64.deb ...
Unpacking curl (8.5.0-2ubuntu10.6) ...
Preparing to unpack .../libcurl3t64-gnutls_8.5.0-2ubuntu10.6_amd64.deb ...
Unpacking libcurl3t64-gnutls:amd64 (8.5.0-2ubuntu10.6) over (8.5.0-2ubuntu10) ...
Setting up libcurl4t64:amd64 (8.5.0-2ubuntu10.6) ...
Setting up libcurl3t64-gnutls:amd64 (8.5.0-2ubuntu10.6) ...
Setting up curl (8.5.0-2ubuntu10.6) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8) ...
osboxes@Wasim:~$
```

A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window. The terminal window has a dark background with light-colored text. At the top, it shows the date and time as "Sep 8 14:23" and the user as "osboxes@Wasim: ~". The terminal window contains a log of package installations and configuration steps. It starts with several "Setting up" messages for gpg-related packages like gnupg-l10n, gpgconf, gpg, gnupg-utils, gpg-agent, gpgsm, dirmngr, keyboxd, and gnupg. Following these are "Processing triggers" for man-db, install-info, and libc-bin. A warning message from gpg about unsafe ownership of its homedir is shown. The terminal then lists several "Hit:" entries from various repositories (security, updates, main) for node\_18.x. It shows a "Fetched 23.7 kB in 1s (18.8 kB/s)" message. After reading the package lists, it indicates a successful configuration of the repository. It then provides help for the "sudo" command, suggesting alternatives like sudo from deb sudo or sudo-ldap. Finally, it shows a command prompt at "osboxes@Wasim: ~\$".

```
Sep 8 14:23  
osboxes@Wasim: ~  
  
Setting up gnupg-l10n (2.4.4-2ubuntu17.3) ...  
Setting up gpgconf (2.4.4-2ubuntu17.3) ...  
Setting up gpg (2.4.4-2ubuntu17.3) ...  
Setting up gnupg-utils (2.4.4-2ubuntu17.3) ...  
Setting up gpg-agent (2.4.4-2ubuntu17.3) ...  
Setting up gpgsm (2.4.4-2ubuntu17.3) ...  
Setting up dirmngr (2.4.4-2ubuntu17.3) ...  
Setting up keyboxd (2.4.4-2ubuntu17.3) ...  
Setting up gnupg (2.4.4-2ubuntu17.3) ...  
Setting up gpg-wks-client (2.4.4-2ubuntu17.3) ...  
Processing triggers for man-db (2.12.0-4build2) ...  
Processing triggers for install-info (7.1-3build2) ...  
Processing triggers for libc-bin (2.39-0ubuntu8) ...  
gpg: WARNING: unsafe ownership on homedir '/home/osboxes/.gnupg'  
Hit:1 http://security.ubuntu.com/ubuntu noble-security InRelease  
Hit:2 http://archive.ubuntu.com/ubuntu noble InRelease  
Hit:3 http://archive.ubuntu.com/ubuntu noble-updates InRelease  
Get:4 https://deb.nodesource.com/node_18.x nodistro InRelease [12.1 kB]  
Hit:5 http://archive.ubuntu.com/ubuntu noble-backports InRelease  
Get:6 https://deb.nodesource.com/node_18.x nodistro/main amd64 Packages [11.6 kB]  
Fetched 23.7 kB in 1s (18.8 kB/s)  
Reading package lists... Done  
2025-09-08 14:23:08 - Repository configured successfully.  
2025-09-08 14:23:08 - To install Node.js, run: apt-get install nodejs -y  
2025-09-08 14:23:08 - You can use N|solid Runtime as a node.js alternative  
2025-09-08 14:23:08 - To install N|solid Runtime, run: apt-get install nsolid -y  
  
Command ' sudo' not found, did you mean:  
  command 'sudo' from deb sudo (1.9.15p5-3ubuntu5.24.04.1)  
  command 'sudo' from deb sudo-ldap (1.9.15p5-3ubuntu5.24.04.1)  
Try: sudo apt install <deb name>  
osboxes@Wasim: ~$
```

## Once installed, check the Node.js version.

Sep 8 14:25  
osboxes@Wasim:~

```
2025-09-08 14:23:08 - You can use N|solid Runtime as a node.js alternative
2025-09-08 14:23:08 - To install N|solid Runtime, run: apt-get install nsolid -y

Command ' sudo' not found, did you mean:
  command 'sudo' from deb sudo (1.9.15p5-3ubuntu5.24.04.1)
  command 'sudo' from deb sudo-ldap (1.9.15p5-3ubuntu5.24.04.1)
Try: sudo apt install <deb name>
osboxes@Wasim:~$ apt-get install nodejs -y
E: Could not open lock file /var/lib/dpkg/lock-frontend - open (13: Permission denied)
E: Unable to acquire the dpkg frontend lock (/var/lib/dpkg/lock-frontend), are you root?
osboxes@Wasim:~$ sudo apt-get install nodejs -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  nodejs
0 upgraded, 1 newly installed, 0 to remove and 545 not upgraded.
Need to get 29.7 MB of archives.
After this operation, 187 MB of additional disk space will be used.
Get:1 https://deb.nodesource.com/node_18.x/nodistro/main amd64 nodejs amd64 18.20.8-1nodesource1 [29.7 MB]
Fetched 29.7 MB in 2s (18.0 MB/s)
Selecting previously unselected package nodejs.
(Reading database ... 147830 files and directories currently installed.)
Preparing to unpack .../nodejs_18.20.8-1nodesource1_amd64.deb ...
Unpacking nodejs (18.20.8-1nodesource1) ...
Setting up nodejs (18.20.8-1nodesource1) ...
Processing triggers for man-db (2.12.0-4build2) ...
osboxes@Wasim:~$ node --version
v18.20.8
osboxes@Wasim:~$ npm --version
10.8.2
osboxes@Wasim:~$
```

The screenshot shows a terminal window on a Linux desktop environment. The terminal output details the installation of Node.js using the apt-get command, which failed initially due to permission issues. It then uses sudo to successfully install the package. Finally, it checks the installed versions of Node.js and npm using the --version option. The desktop taskbar at the bottom shows various application icons.

Sep 8 16:08

osboxes@Wasim: ~

```
npm warn deprecated @truffle/abi-utils@1.0.3: Package no longer supported. Contact Support at https://github.com/trufflesuite/abi-utils#v1.0.3
npm warn deprecated abstract-leveldown@6.3.0: Superseded by abstract-level (https://github.com/Level/abstract-leveldown)
npm warn deprecated abstract-leveldown@7.2.0: Superseded by abstract-level (https://github.com/Level/abstract-leveldown)
npm warn deprecated abstract-leveldown@6.2.3: Superseded by abstract-level (https://github.com/Level/abstract-leveldown)
npm warn deprecated cids@0.7.5: This module has been superseded by the multiformats module
npm warn deprecated @ensdomains/ens@0.4.5: Please use @ensdomains/ens-contracts
npm warn deprecated apollo-server-core@3.13.0: The `apollo-server-core` package is part of Apollo Server. It is now end-of-life (as of October 22nd 2023 and October 22nd 2024, respectively). This package's features are now found in the `@apollo/server` package. See https://www.apollographql.com/docs/apollo-server/previous-versions for details.
npm warn deprecated @truffle/debugger@12.1.5: Package no longer supported. Contact Support at https://github.com/trufflesuite/debugger#v12.1.5
npm warn deprecated @ensdomains/resolver@0.2.4: Please use @ensdomains/ens-contracts
npm warn deprecated leveldown@5.6.0: Superseded by classic-level (https://github.com/Level/leveldown)
npm warn deprecated @truffle/db@2.0.36: Package no longer supported. Contact Support at https://github.com/trufflesuite/db#v2.0.36
npm warn deprecated @truffle/codec@0.17.3: Package no longer supported. Contact Support at https://github.com/trufflesuite/codec#v0.17.3

added 1174 packages in 2m

105 packages are looking for funding
  run `npm fund` for details
npm notice
npm notice New major version of npm available! 10.8.2 -> 11.6.0
npm notice Changelog: https://github.com/npm/cli/releases/tag/v11.6.0
npm notice To update run: npm install -g npm@11.6.0
npm notice
osboxes@Wasim:~$
```

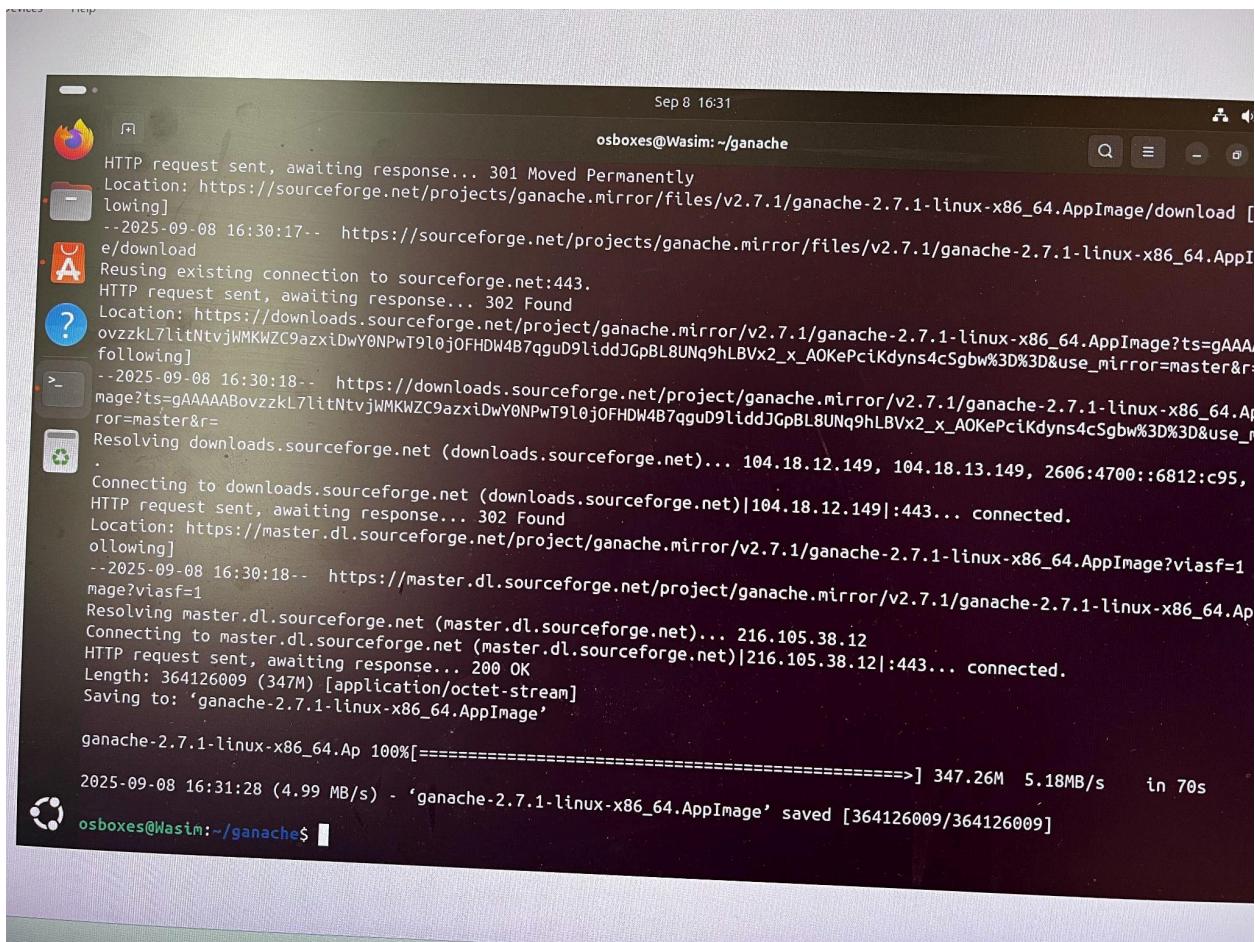
## Once installed, check the Truffle, Ganache, Solidity, Node, web3 version

```
  ort for more info.
  npm warn deprecated @ensdomains/resolver@0.2.4: Please use @ensdomains/ens-contracts
  npm warn deprecated leveldown@5.6.0: Superseded by classic-level (https://github.com/Level
  npm warn deprecated @truffle/db@2.0.36: Package no longer supported. Contact Support at ht
  r more info.
  npm warn deprecated @truffle/codec@0.17.3: Package no longer supported. Contact Support at
  for more info.

  ? added 1174 packages in 2m

  > - 105 packages are looking for funding
    run `npm fund` for details
  npm notice
  npm notice New major version of npm available! 10.8.2 -> 11.6.0
  npm notice Changelog: https://github.com/npm/cli/releases/tag/v11.6.0
  npm notice To update run: npm install -g npm@11.6.0
  npm notice
  osboxes@Wasim:~$ npm install -g npm@11.6.0
  npm error code EBADENGINE
  npm error engine Unsupported engine
  npm error engine Not compatible with your version of node/npm: npm@11.6.0
  npm error notsup Not compatible with your version of node/npm: npm@11.6.0
  npm error notsup Required: {"node":"^20.17.0 || >=22.9.0"}
  npm error notsup Actual: {"npm":"10.8.2","node":"v18.20.8"}
  npm error A complete log of this run can be found in: /home/osboxes/.npm/_logs/2025-09-08T20_09
  osboxes@Wasim:~$ truffle version
  Truffle v5.11.5 (core: 5.11.5)
  Ganache v7.9.1
  Solidity v0.5.16 (solc-js)
  Node v18.20.8
  Web3.js v1.10.0
  osboxes@Wasim:~$
```

## Download Ganache



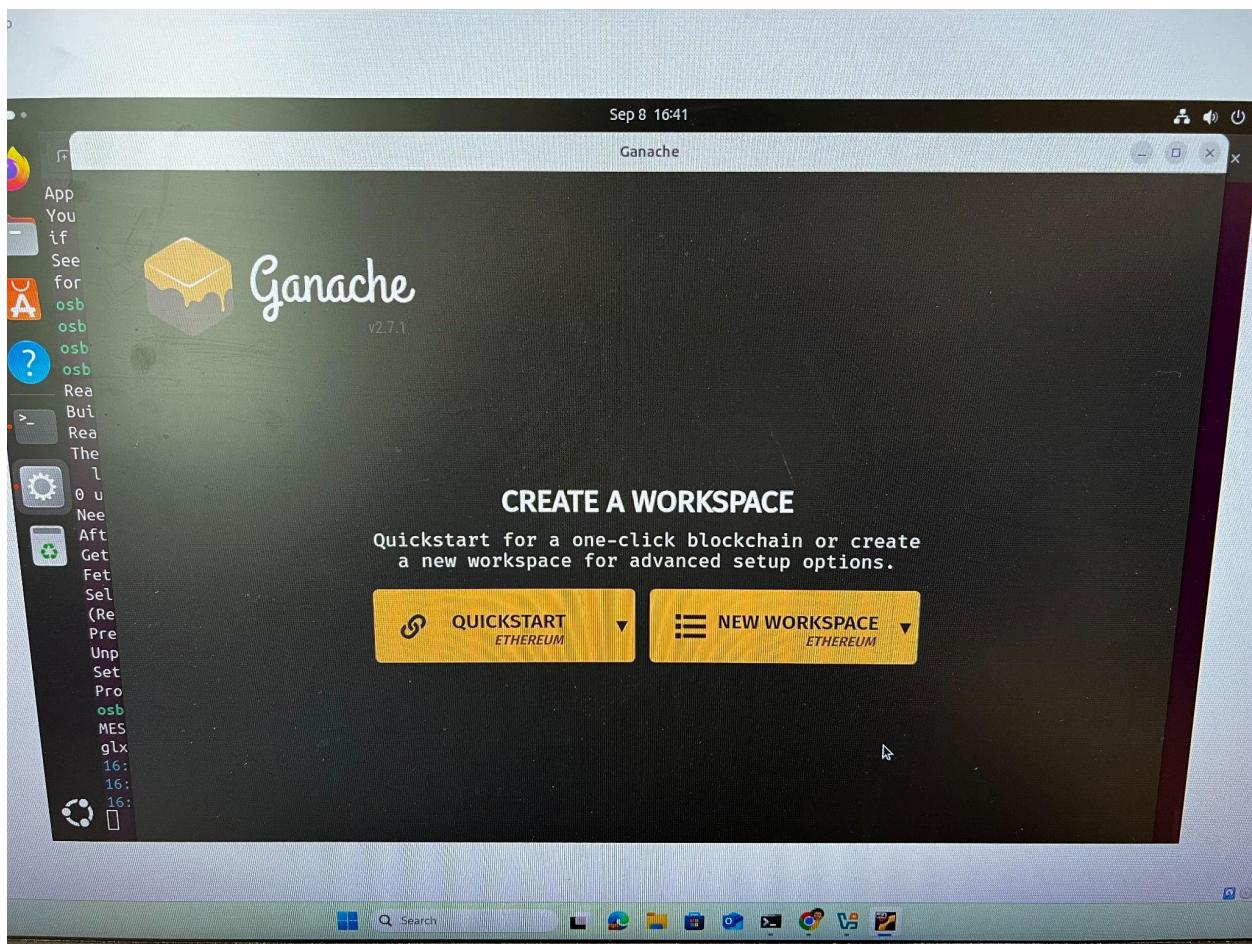
The screenshot shows a terminal window titled "osboxes@Wasim: ~/ganache" running on a Linux system. The terminal displays the process of downloading the Ganache 2.7.1 AppImage file from SourceForge. The output shows the curl command being executed, the redirection to a master mirror, and the progress of the download. The download completes successfully at 16:31:28 on Sep 8, 2025.

```
Sep 8 16:31
osboxes@Wasim: ~/ganache
HTTP request sent, awaiting response... 301 Moved Permanently
Location: https://sourceforge.net/projects/ganache.mirror/files/v2.7.1/ganache-2.7.1-linux-x86_64.AppImage/download [following]
--2025-09-08 16:30:18-- https://sourceforge.net/projects/ganache.mirror/files/v2.7.1/ganache-2.7.1-linux-x86_64.AppImage/download
Reusing existing connection to sourceforge.net:443.
HTTP request sent, awaiting response... 302 Found
Location: https://downloads.sourceforge.net/project/ganache.mirror/v2.7.1/ganache-2.7.1-linux-x86_64.AppImage?ts=gAAA
ovzzkL7litNtvjWMKWC9azxiDwY0NPwT9l0j0FHDW4B7qguD9liddJGpBL8UNq9hLBVx2_x_A0KePciKdyns4cSgbw%3D%3D&use_mirr
or=master&r
--2025-09-08 16:30:18-- https://downloads.sourceforge.net/project/ganache.mirror/v2.7.1/ganache-2.7.1-linux-x86_64.Ap
pImage?ts=gAAAAABovzzkL7litNtvjWMKWC9azxiDwY0NPwT9l0j0FHDW4B7qguD9liddJGpBL8UNq9hLBVx2_x_A0KePciKdyns4cSgbw%3D%3D&use_m
IRROR=master&r
Resolving downloads.sourceforge.net (downloads.sourceforge.net)... 104.18.12.149, 104.18.13.149, 2606:4700::6812:c95,
Connecting to downloads.sourceforge.net (downloads.sourceforge.net)|104.18.12.149|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://master.dl.sourceforge.net/project/ganache.mirror/v2.7.1/ganache-2.7.1-linux-x86_64.AppImage?viasf=1
[following]
--2025-09-08 16:30:18-- https://master.dl.sourceforge.net/project/ganache.mirror/v2.7.1/ganache-2.7.1-linux-x86_64.Ap
pImage?viasf=1
Resolving master.dl.sourceforge.net (master.dl.sourceforge.net)... 216.105.38.12
Connecting to master.dl.sourceforge.net (master.dl.sourceforge.net)|216.105.38.12|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 364126009 (347M) [application/octet-stream]
Saving to: 'ganache-2.7.1-linux-x86_64.AppImage'

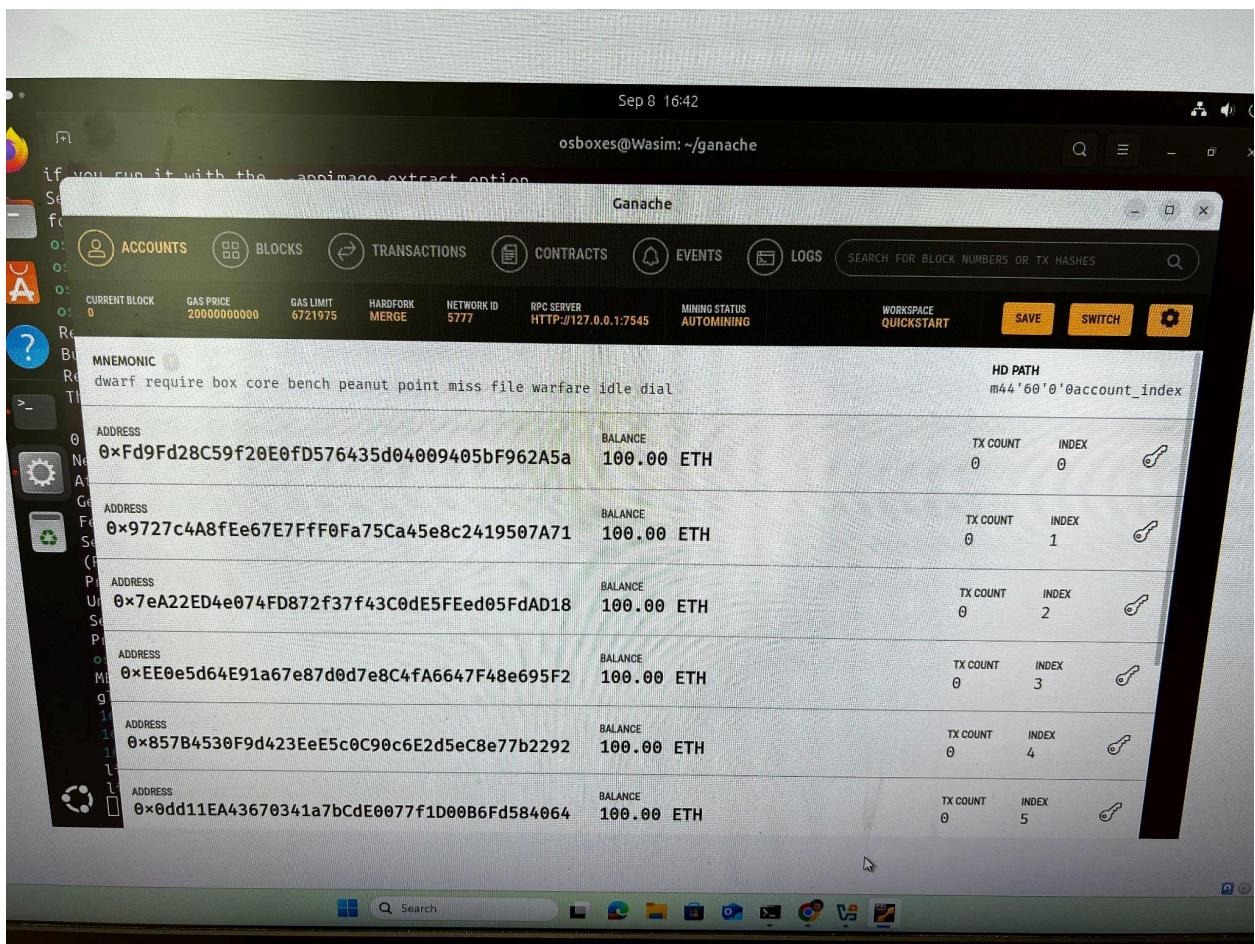
ganache-2.7.1-linux-x86_64.Ap 100%[=====] 347.26M 5.18MB/s in 70s
2025-09-08 16:31:28 (4.99 MB/s) - 'ganache-2.7.1-linux-x86_64.AppImage' saved [364126009/364126009]

osboxes@Wasim: ~/ganache$
```

## Ganache



## Ganache mnemonics



Sep 8 16:47

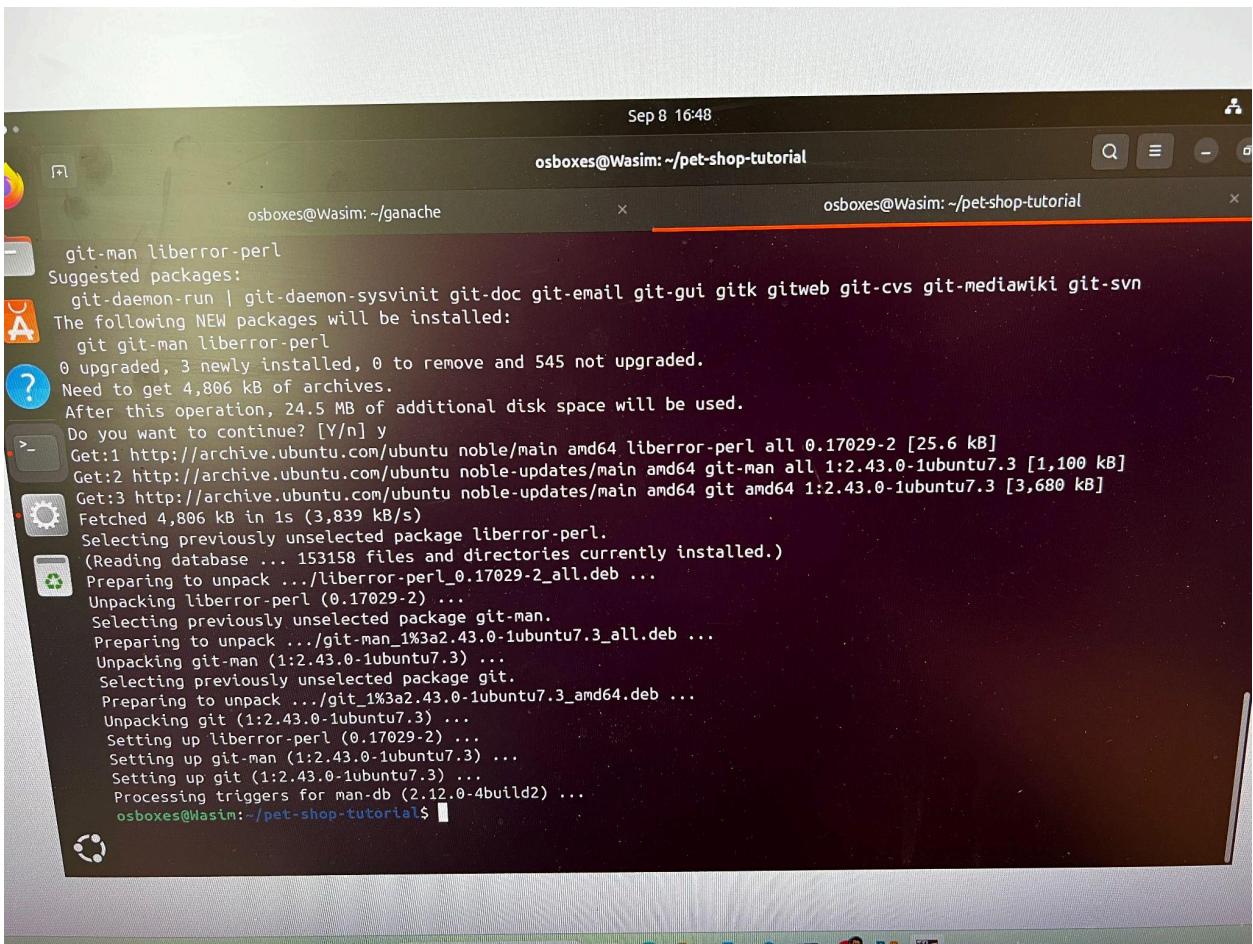
osboxes@Wasim: ~/pet-shop-tutorial

```
osboxes@Wasim: ~/ganache
```

npm warn deprecated source-map-resolve@0.5.2: See <https://github.com/lydell/source-map-resolve#deprecate>  
npm warn deprecated is-data-descriptor@1.0.0: Please upgrade to v1.0.1  
npm warn deprecated is-accessor-descriptor@1.0.0: Please upgrade to v1.0.1  
npm warn deprecated set-value@0.4.3: Critical bug fixed in v3.0.1, please upgrade to the latest version.  
npm warn deprecated is-data-descriptor@1.0.0: Please upgrade to v1.0.1  
npm warn deprecated is-accessor-descriptor@1.0.0: Please upgrade to v1.0.1  
npm warn deprecated is-accessor-descriptor@1.0.0: Please upgrade to v1.0.1  
npm warn deprecated is-data-descriptor@1.0.0: Please upgrade to v1.0.1  
npm warn deprecated is-data-descriptor@1.0.0: Please upgrade to v1.0.1  
npm warn deprecated axios@0.17.1: Critical security vulnerability fixed in v0.21.1. For more information, see <https://github.com/axios/axios/pull/3410>  
npm notice  
npm notice New major version of npm available! 10.8.2 -> 11.6.0  
npm notice Changelog: <https://github.com/npm/cli/releases/tag/v11.6.0>  
npm notice To update run: npm install -g npm@11.6.0  
npm notice  
✓ Cleaning up temporary files  
✓ Setting up box  
  
Unbox successful, sweet!  
  
Commands:  
Compile: truffle compile  
Migrate: truffle migrate  
Test contracts: truffle test  
Run dev server: npm run dev

osboxes@Wasim: ~/pet-shop-tutorial\$

## Creating Truffle project



The screenshot shows a terminal window titled "osboxes@Wasim: ~/pet-shop-tutorial" with two tabs open. The left tab shows the command "osboxes@Wasim: ~\$ sudo apt-get update" and the right tab shows the command "osboxes@Wasim: ~\$ sudo apt-get install git liberror-perl". The terminal output is as follows:

```
git-man liberror-perl
Suggested packages:
  git-daemon-run | git-daemon-sysvinit git-doc git-email git-gui gitk gitweb git-cvs git-mediawiki git-svn
The following NEW packages will be installed:
  git git-man liberror-perl
0 upgraded, 3 newly installed, 0 to remove and 545 not upgraded.
Need to get 4,806 kB of archives.
After this operation, 24.5 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://archive.ubuntu.com/ubuntu noble/main amd64 liberror-perl all 0.17029-2 [25.6 kB]
Get:2 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 git-man all 1:2.43.0-1ubuntu7.3 [1,100 kB]
Get:3 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 git amd64 1:2.43.0-1ubuntu7.3 [3,680 kB]
Fetched 4,806 kB in 1s (3,839 kB/s)
Selecting previously unselected package liberror-perl.
(Reading database ... 153158 files and directories currently installed.)
Preparing to unpack .../liberror-perl_0.17029-2_all.deb ...
Unpacking liberror-perl (0.17029-2) ...
Selecting previously unselected package git-man.
Preparing to unpack .../git-man_1%3a2.43.0-1ubuntu7.3_all.deb ...
Unpacking git-man (1:2.43.0-1ubuntu7.3) ...
Selecting previously unselected package git.
Preparing to unpack .../git_1%3a2.43.0-1ubuntu7.3_amd64.deb ...
Unpacking git (1:2.43.0-1ubuntu7.3) ...
Setting up liberror-perl (0.17029-2) ...
Setting up git-man (1:2.43.0-1ubuntu7.3) ...
Setting up git (1:2.43.0-1ubuntu7.3) ...
Processing triggers for man-db (2.12.0-4build2) ...
osboxes@Wasim:~/pet-shop-tutorial$
```

The screenshot shows a Linux desktop environment with a terminal window and a file browser window.

The terminal window (title: osboxes@Wasim: ~/pet-shop-tutorial) displays the following log output:

```
Get:1 http://archive.ubuntu.com/ubuntu noble/main amd64 liberror-perl all 0.17029-2 [25.6 kB]
Get:2 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 git-man all 1:2.43.0-1ubuntu7.3 [1,100 kB]
Get:3 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 git amd64 1:2.43.0-1ubuntu7.3 [3,680 kB]
Fetched 4,806 kB in 1s (3,839 kB/s)
Selecting previously unselected package liberror-perl.
(Reading database ... 153158 files and directories currently installed.)
Preparing to unpack .../liberror-perl_0.17029-2_all.deb ...
Unpacking liberror-perl (0.17029-2) ...
Selecting previously unselected package git-man.
Preparing to unpack .../git-man_1x3a2.43.0-1ubuntu7.3_all.deb ...
Unpacking git-man (1:2.43.0-1ubuntu7.3) ...
Selecting previously unselected package git.
Preparing to unpack .../git_1x3a2.43.0-1ubuntu7.3_amd64.deb ...
Unpacking git (1:2.43.0-1ubuntu7.3) ...
Setting up liberror-perl (0.17029-2) ...
Setting up git-man (1:2.43.0-1ubuntu7.3) ...
Setting up git (1:2.43.0-1ubuntu7.3) ...
Processing triggers for man-db (2.12.0-4build2) ...
osboxes@Wasim:~/pet-shop-tutorial$ git -c http.sslVerify=false clone https://github.com/truffle-box/pet-shop-box.git
Cloning into 'pet-shop-box'...
remote: Enumerating objects: 200, done.
remote: Counting objects: 100% (48/48), done.
remote: Compressing objects: 100% (33/33), done.
remote: Total 200 (delta 30), reused 24 (delta 15), pack-reused 152 (from 1)
Receiving objects: 100% (200/200), 687.32 KiB | 5.82 MiB/s, done.
Resolving deltas: 100% (77/77), done.
osboxes@Wasim:~/pet-shop-tutorial$ ls
box-img-lg.png  bs-config.json  LICENSE      node_modules  package-lock.json  src    truffle-config.js
box-img-sm.png  contracts       migrations   package.json  pet-shop-box    test
```

The file browser window (title: osboxes@Wasim: ~/pet-shop-tutorial) shows the directory structure of the cloned repository:

- box-img-lg.png
- bs-config.json
- LICENSE
- node\_modules
- package-lock.json
- src
- truffle-config.js
- box-img-sm.png
- contracts
- migrations
- package.json
- pet-shop-box
- test

## Creating Adoption.sol file inside the contracts

```
Sep 12 17:05
osboxes@Wasim: ~/pet-shop-
osboxes@Wasim: ~/ganache
25.09.11 16:50:01 304 GET /images/scottish-terrier.jpeg
25.09.11 16:50:01 304 GET /images/french-bulldog.jpeg
25.09.11 16:50:01 304 GET /images/boxer.jpeg
25.09.11 16:50:01 304 GET /images/golden-retriever.jpeg
^C
osboxes@Wasim:~/pet-shop-tutorial/pet-shop-box$ 
osboxes@Wasim:~/pet-shop-tutorial/pet-shop-box$ 
osboxes@Wasim:~/pet-shop-tutorial/pet-shop-box$ ls
box-img-lg.png  bs-config.json  LICENSE  package.json      READ
box-img-sm.png  contracts      migrations  package-lock.json  src
osboxes@Wasim:~/pet-shop-tutorial/pet-shop-box$ ls
box-img-lg.png  bs-config.json  LICENSE  package.json      READ
box-img-sm.png  contracts      migrations  package-lock.json  src
osboxes@Wasim:~/pet-shop-tutorial/pet-shop-box$ cd ..
osboxes@Wasim:~/pet-shop-tutorial$ ls
box-img-lg.png  bs-config.json  contracts  migrations  package.json
box-img-sm.png  build          LICENSE    node_modules  package-lock.json
osboxes@Wasim:~/pet-shop-tutorial$ cd migrations/
osboxes@Wasim:~/pet-shop-tutorial/migrations$ ls
1_initial_migration.js  2_initial_migration.js
osboxes@Wasim:~/pet-shop-tutorial/migrations$ ls
1_initial_migration.js  2_initial_migration.js
osboxes@Wasim:~/pet-shop-tutorial/migrations$ cd ..
osboxes@Wasim:~/pet-shop-tutorial$ ls
box-img-lg.png  bs-config.json  contracts  migrations  package.json
box-img-sm.png  build          LICENSE    node_modules  package-lock.json
osboxes@Wasim:~/pet-shop-tutorial$ cd contracts/
osboxes@Wasim:~/pet-shop-tutorial/contracts$ ls
Adoption.sol  Migrations.sol
osboxes@Wasim:~/pet-shop-tutorial/contracts$
```

## A look inside the Adoption.sol file

```
osboxes@Wasim: ~/pet-shop-tutorial/contracts$ cat Adoption.sol
pragma solidity ^0.5.0;

contract Adoption {
    address[16]public adopters;

    // Adopting a pet

    function adopt(uint petID) public returns (uint) {
        require (petID>=0 && petID <=15);

        adopters[petID]=msg.sender;

        return petID;
    }

    //Retrieving the adopters
    function getAdopters() public view returns (address[16] memory)
    {
        return adopters;
    }
}

osboxes@Wasim: ~/pet-shop-tutorial/contracts$
```

## After creating the Adoption.sol file, compile the smart contract

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "osboxes@Wasim: ~/pet-shop-tutorial". The user has navigated to the directory `~/pet-shop-tutorial/contracts` and is working on the file `Adoption.sol`. They run the command `truffle compile` to compile the contracts. The terminal output shows the compilation process, including the compilation of `Adoption.sol` and `Migrations.sol`, and the generation of artifacts in the `build/contracts` directory. The terminal window is part of a desktop interface with a taskbar at the bottom.

```
return petID;
}

//Retrieving the adopters
function getAdopters() public view returns (address[16] memory){
    return adopters;
}
osboxes@Wasim:~/pet-shop-tutorial/contracts$ osboxes@Wasim:~/pet-shop-tutorial/contracts$ osboxes@Wasim:~/pet-shop-tutorial/contracts$ ls Adoption.sol Migrations.sol
osboxes@Wasim:~/pet-shop-tutorial/contracts$ vi Adoption.sol
osboxes@Wasim:~/pet-shop-tutorial/contracts$ cd ..
osboxes@Wasim:~/pet-shop-tutorial$ ls box-img-lg.png bs-config.json LICENSE node_modules package-lock.json src tru box-img-sm.png contracts migrations package.json pet-shop-box test
osboxes@Wasim:~/pet-shop-tutorial$ truffle compile

Compiling your contracts...
=====
> Compiling ./contracts/Adoption.sol
> Compiling ./contracts/Migrations.sol
> Artifacts written to /home/osboxes/pet-shop-tutorial/build/contracts
> Compiled successfully using:
  - solc: 0.5.16+commit.9c3226ce.Emscripten clang
osboxes@Wasim:~/pet-shop-tutorial$
```

## Creating 2\_initial\_migration.js file

```
Sep 12 17:00:45 osboxes@Wasim:~/pet-shop
```

```
osboxes@Wasim: ~/ganache
```

```
quire (petID>=0 && petID <=15);
```

```
adoptioners[petID]=msg.sender;
```

```
return petID;
```

```
//Retrieving the adopters
```

```
function getAdopters() public view returns (address[16] memory){
```

```
return adopters;
```

```
}
```

```
}
```

```
osboxes@Wasim:~/pet-shop-tutorial/contracts$ ls
```

```
Adoption.sol Migrations.sol
```

```
osboxes@Wasim:~/pet-shop-tutorial/contracts$ cd ..
```

```
osboxes@Wasim:~/pet-shop-tutorial$ ls
```

```
box-img-lg.png bs-config.json contracts migrations package.json
```

```
box-img-sm.png build LICENSE node_modules package-lock.
```

```
osboxes@Wasim:~/pet-shop-tutorial$ cd migrations/
```

```
osboxes@Wasim:~/pet-shop-tutorial/migrations$ ls
```

```
1_initial_migration.js 2_initial_migration.js
```

```
osboxes@Wasim:~/pet-shop-tutorial/migrations$
```

```
osboxes@Wasim:~/pet-shop-tutorial/migrations$
```

## An inside look at 2\_initial\_migration.js file

```
Sep 12 17:34
osboxes@Wasim: ~/pet-shop-tutorial/
osboxes@Wasim: ~/ganache
x

adoption.adopters[petID]=msg.sender;

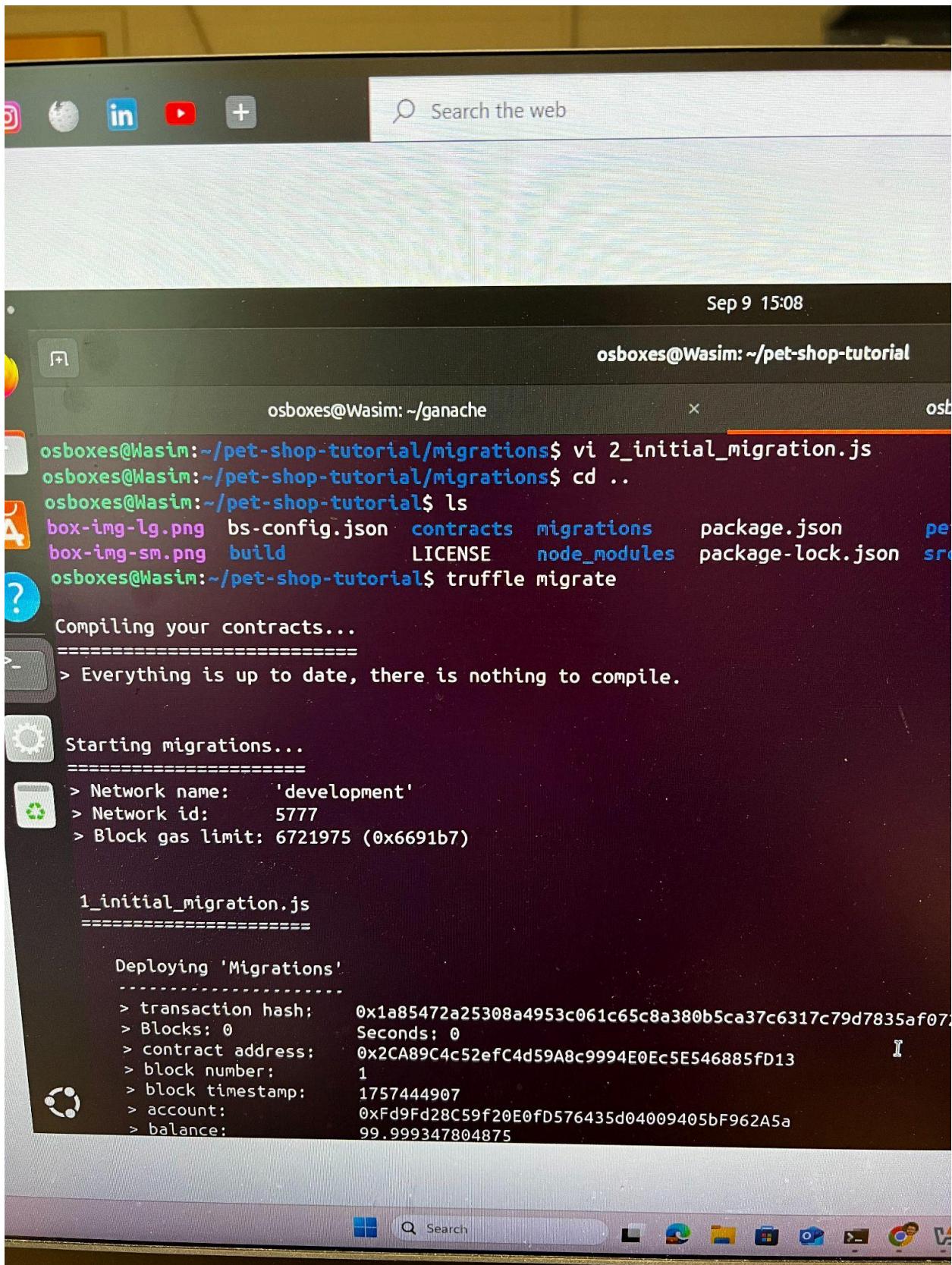
function getAdopters() public view returns (address[16] memory){
    return adoption.adopters;
}

Retrieving the adopters
sboxes@Wasim:~/pet-shop-tutorial/contracts$ ls
adoption.sol  Migrations.sol
sboxes@Wasim:~/pet-shop-tutorial/contracts$ cd ..
sboxes@Wasim:~/pet-shop-tutorial$ ls
box-img-lg.png  bs-config.json  contracts  migrations  package.json
box-img-sm.png  build          LICENSE      node_modules  package-lock.json
sboxes@Wasim:~/pet-shop-tutorial$ cd migrations/
sboxes@Wasim:~/pet-shop-tutorial/migrations$ ls
1_initial_migration.js  2_initial_migration.js
sboxes@Wasim:~/pet-shop-tutorial/migrations$ 
sboxes@Wasim:~/pet-shop-tutorial/migrations$ cat 2_initial_migration.js
var Adoption = artifacts.require("Adoption");

module.exports = function(deployer) {
  deployer.deploy(Adoption);
};

sboxes@Wasim:~/pet-shop-tutorial/migrations$ 
```

## Migrating the contract to the Blockchain



osboxes@Wasim: ~/pet-shop-tutorial

```
osboxes@Wasim:~/pet-shop-tutorial/migrations$ vi 2_initial_migration.js
osboxes@Wasim:~/pet-shop-tutorial/migrations$ cd ..
osboxes@Wasim:~/pet-shop-tutorial$ ls
box-img-lg.png  bs-config.json  contracts  migrations  package.json  pet
box-img-sm.png  build          LICENSE     node_modules  package-lock.json  src
osboxes@Wasim:~/pet-shop-tutorial$ truffle migrate
Compiling your contracts...
=====
> Everything is up to date, there is nothing to compile.

Starting migrations...
=====
> Network name:    'development'
> Network id:      5777
> Block gas limit: 6721975 (0x6691b7)

1_initial_migration.js
=====

Deploying 'Migrations'
-----
> transaction hash: 0x1a85472a25308a4953c061c65c8a380b5ca37c6317c79d7835af07
> Blocks: 0           Seconds: 0
> contract address: 0x2CA89C4c52efC4d59A8c9994E0Ec5E546885fD13
> block number:      1
> block timestamp:   1757444907
> account:           0xFd9Fd28C59f20E0fD576435d04009405bF962A5a
> balance:            99.999347804875
```

The screenshot shows a Linux desktop environment with a dark theme. At the top, there is a dock with icons for messaging, social media, and productivity tools. A search bar is also present. Below the dock, a terminal window is open, displaying the output of a Ganache deployment command. The file manager window shows a file named '2\_initial\_migration.js'.

```
Sep 10 12:49
osboxes@Wasim: ~/pet-shop-tutorial
osboxes@Wasim: ~/ganache
2_initial_migration.js
=====
Deploying 'Adoption'
-----
> transaction hash: 0x2610dc82eac87d11fd06d76b33ae74968e5fcfd188417e152cbc33ab2166
> Blocks: 0
> contract address: 0x81383AcBFBE8Df3155ea5a6A72684fA08f6C5b9a
> block number: 9
> block timestamp: 1757522385
> account: 0xFd9Fd28C59f20E0fD576435d04009405bF962A5a
> balance: 99.996457512884814669
> gas used: 203827 (0x31c33)
> gas price: 2.813081049 gwei
> value sent: 0 ETH
> total cost: 0.000573381870974523 ETH

> Saving migration to chain.
> Saving artifacts
-----
> Total cost: 0.000573381870974523 ETH

Summary
=====
> Total deployments: 1
> Final cost: 0.000573381870974523 ETH
```

osboxes@Wasim:~/pet-shop-tutorial\$

## Testing the smart contract using Solidity

```
Sep 10 13:42
osboxes@Wasim: ~/pet-shop-tutor
osboxes@Wasim: ~/ganache
osboxes@Wasim: ~/pet-shop-tutorial/test$ vi TestAdoption.sol
osboxes@Wasim: ~/pet-shop-tutorial/test$ vi TestAdoption.sol
osboxes@Wasim: ~/pet-shop-tutorial/test$ ls
TestAdoption.sol
osboxes@Wasim: ~/pet-shop-tutorial/test$ cd ..
osboxes@Wasim: ~/pet-shop-tutorial$ ls
box-img-lg.png  bs-config.json  contracts  migrations  package.json
box-img-sm.png  build          LICENSE     node_modules  package-lock.json
osboxes@Wasim: ~/pet-shop-tutorial$ truffle test
Using network 'development'.

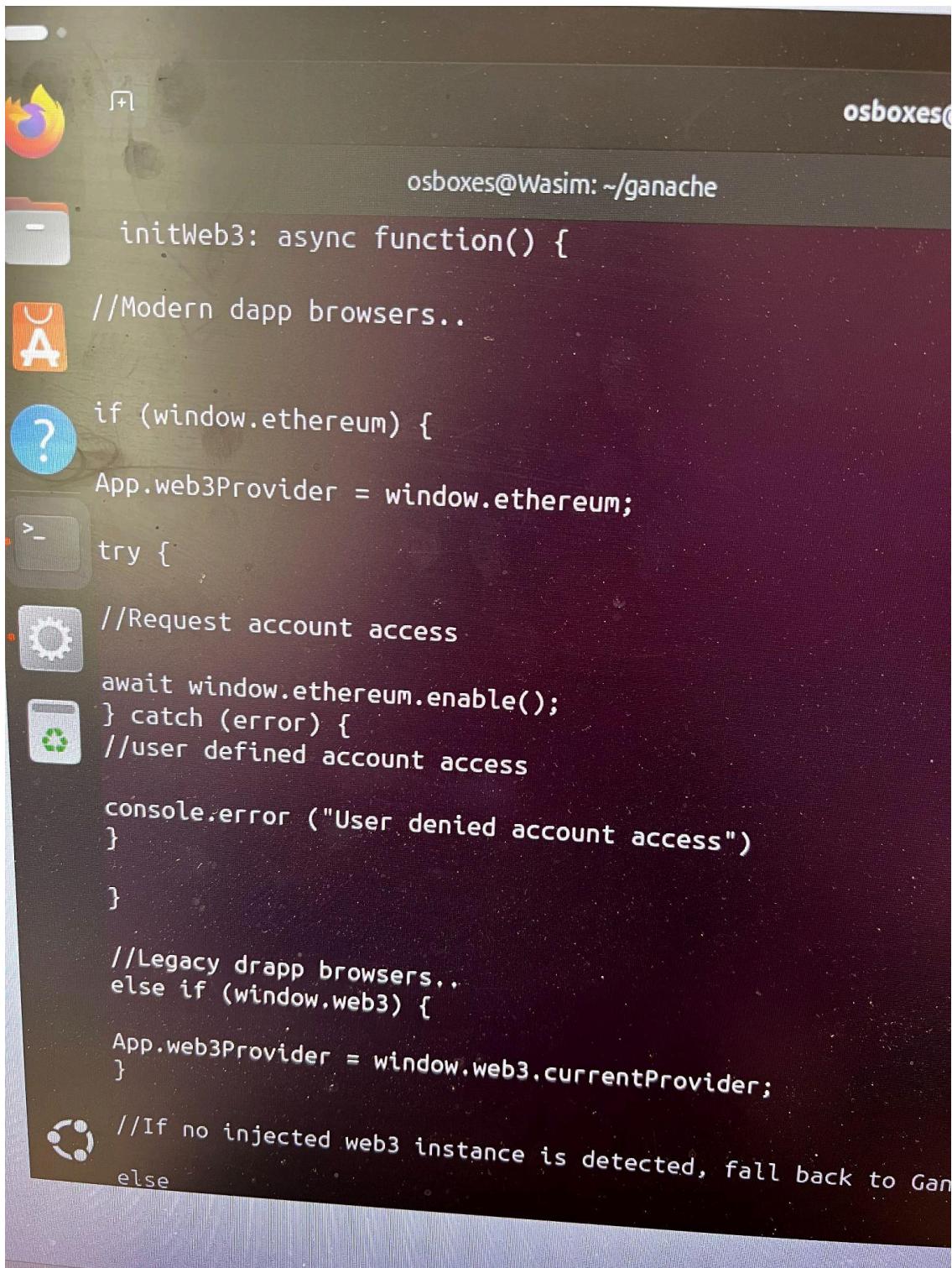
Compiling your contracts...
=====
> Compiling ./test/TestAdoption.sol
> Artifacts written to /tmp/test--65866-esZEXynuYBqI
> Compiled successfully using:
  - solc: 0.5.16+commit.9c3226ce.Emscripten clang

TestAdoption
✓ testUserCanAdoptPet (166ms)
✓ testGetAdopterAddressByPetID (94ms)
✓ testGetAdopterAddressByPetIdInArray (176ms)

3 passing (10s)
osboxes@Wasim: ~/pet-shop-tutorial$
```

## Creating a user interface to interact with the smart contract

### Instantiating web3



The screenshot shows a terminal window on a Linux desktop. The desktop background features icons for a browser, file manager, terminal, and system settings. The terminal window has a dark theme and displays the following code:

```
osboxes@Wasim: ~/ganache
initWeb3: async function() {
    //Modern dapp browsers..
    if (window.ethereum) {
        App.web3Provider = window.ethereum;
        try {
            //Request account access
            await window.ethereum.enable();
        } catch (error) {
            //user defined account access
            console.error ("User denied account access")
        }
    }
    //Legacy dapp browsers..
    else if (window.web3) {
        App.web3Provider = window.web3.currentProvider;
    }
    //If no injected web3 instance is detected, fall back to Gan
    else
```

## Instantiating the contract

```
osboxes@Wasim: ~/ganache
  return App.initContract();
},
initContract: function() {
$.getJSON ('Adoption.json', function(data) {
//Get the necessary contract artifact file and instantiate it
var AdoptionArtifact =data;
App.contracts.Adoption.setProvider(App.web3Provider);
//use Our contract to retrieve and mark the adopted pets
return App.markAdopted();
}),
return App.bindEvents();
},
bindEvents: function() {
$(document).on('click', '.btn-adopt', App.handleAdopt);
}
```

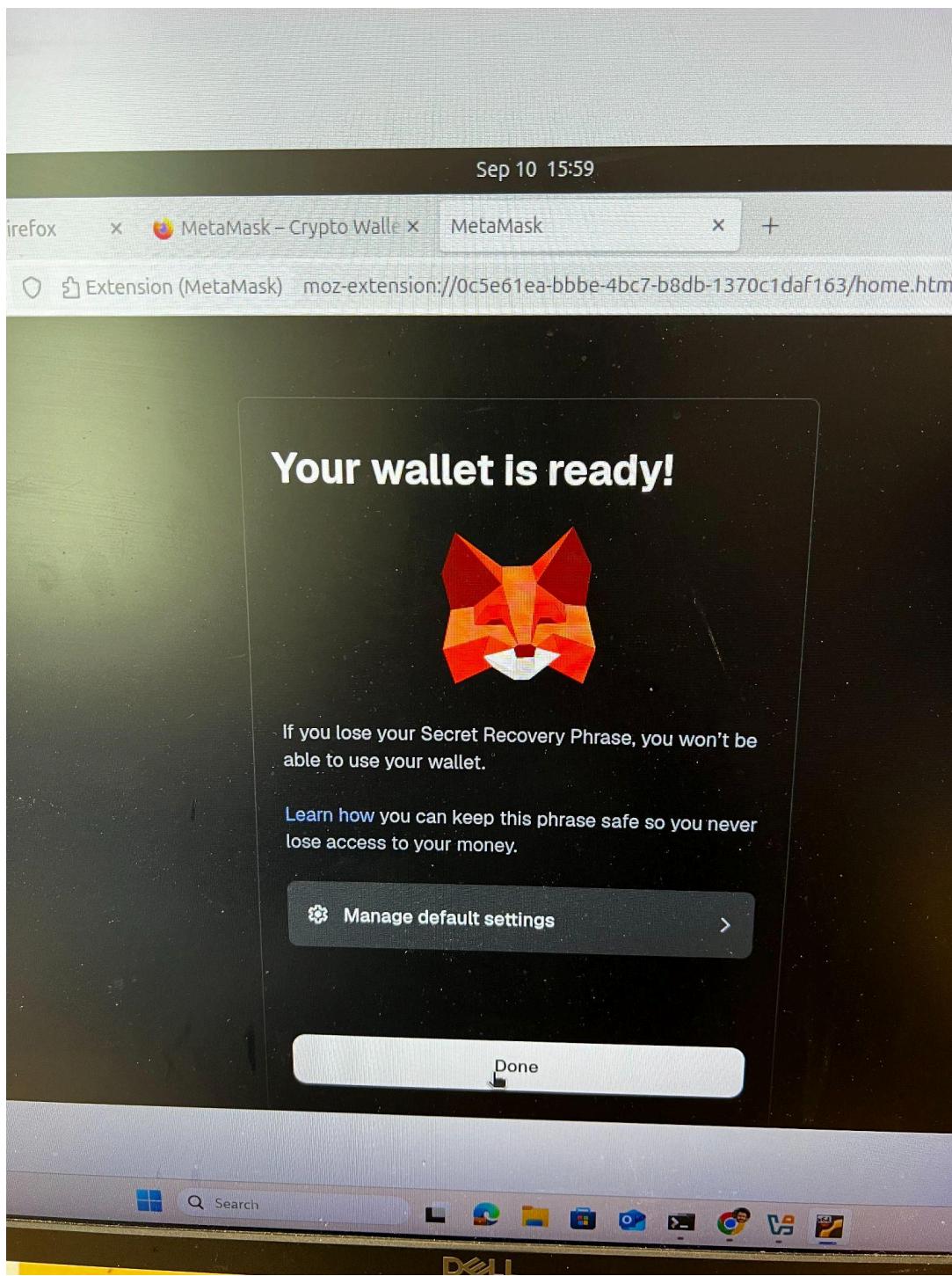
## Getting the adopted pets and updating the UI

## Handling adopt() function

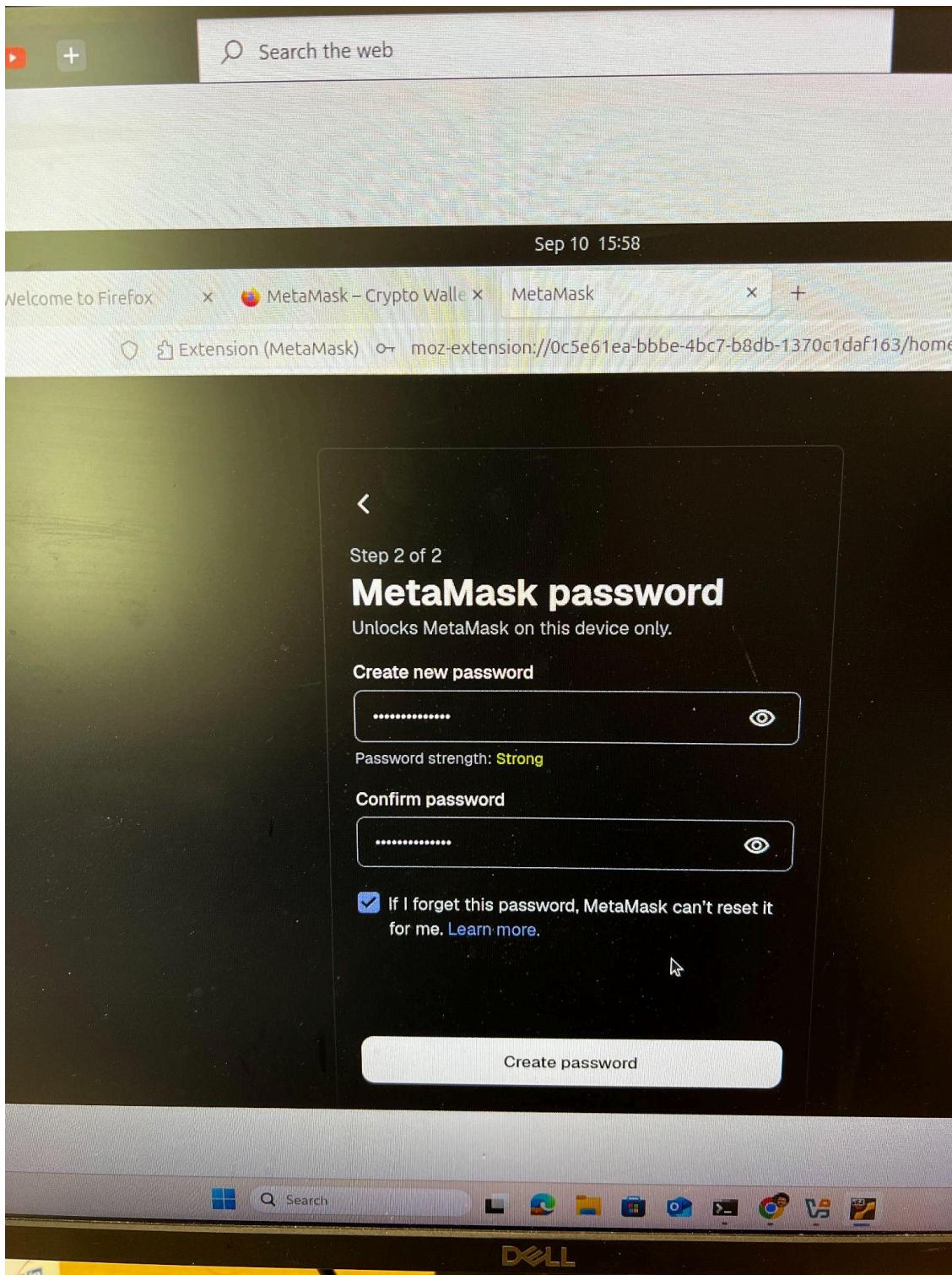
The screenshot shows a terminal window titled "osboxes@Wasim: ~/ganache". The terminal contains the following JavaScript code:

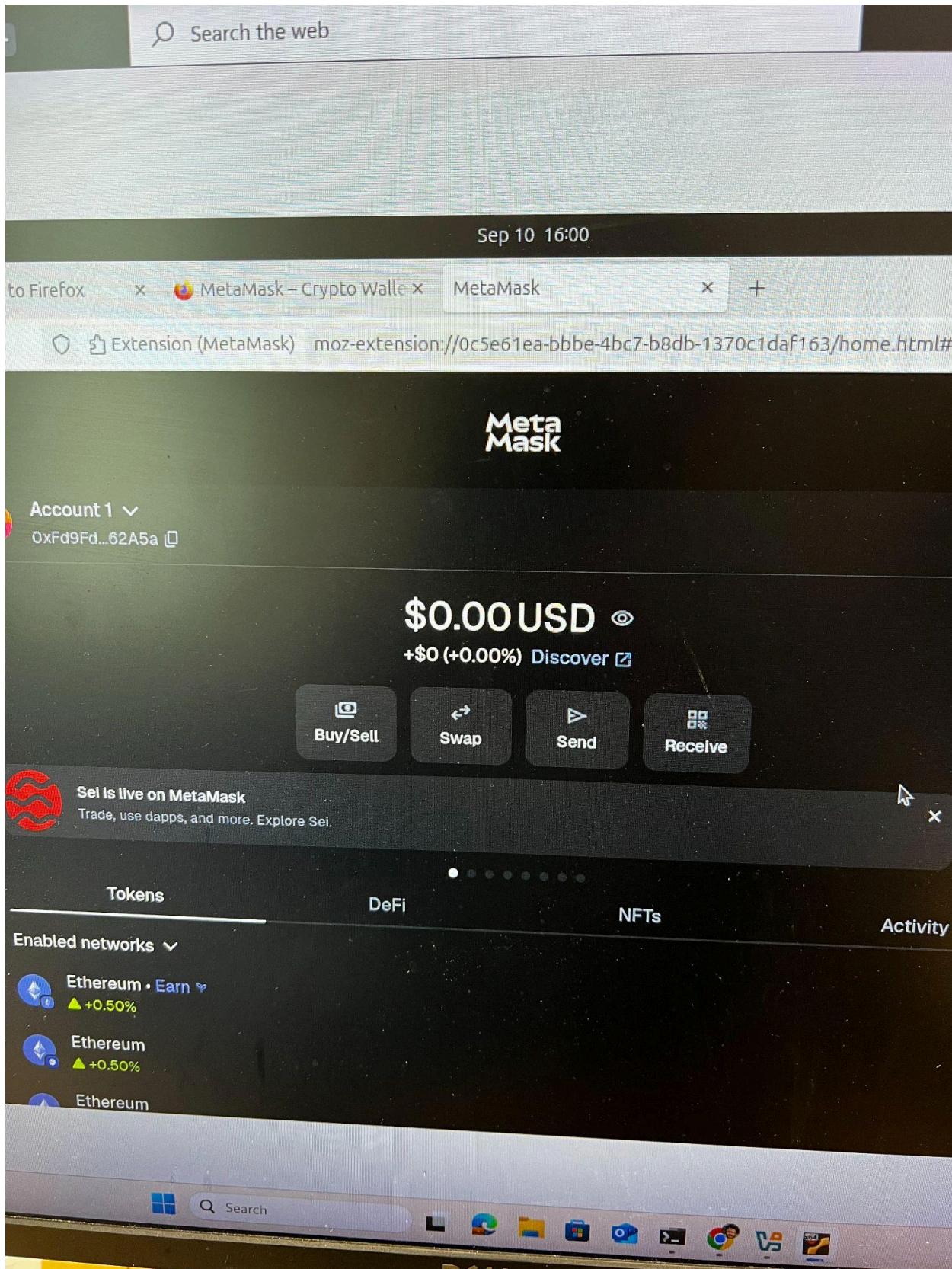
```
},  
handleAdopt: function(event) {  
    event.preventDefault();  
    var petId = parseInt($(event.target).data('id'));  
    var adoptionInstance;  
    web3.eth.getAccounts(function(error, account) {  
        if (error) {  
            console.log(error);  
        }  
        var account = accounts[0];  
        App.contracts.Adoption.deployed().then(function(instance) {  
            adoptionInstance = instance;  
            //Execute adopt as a transaction by sending account  
            return adoptionInstance.adopt(petId, {from:account});  
        }).then(function(result) {  
    });  
};
```

## Installing and configuring Metamask

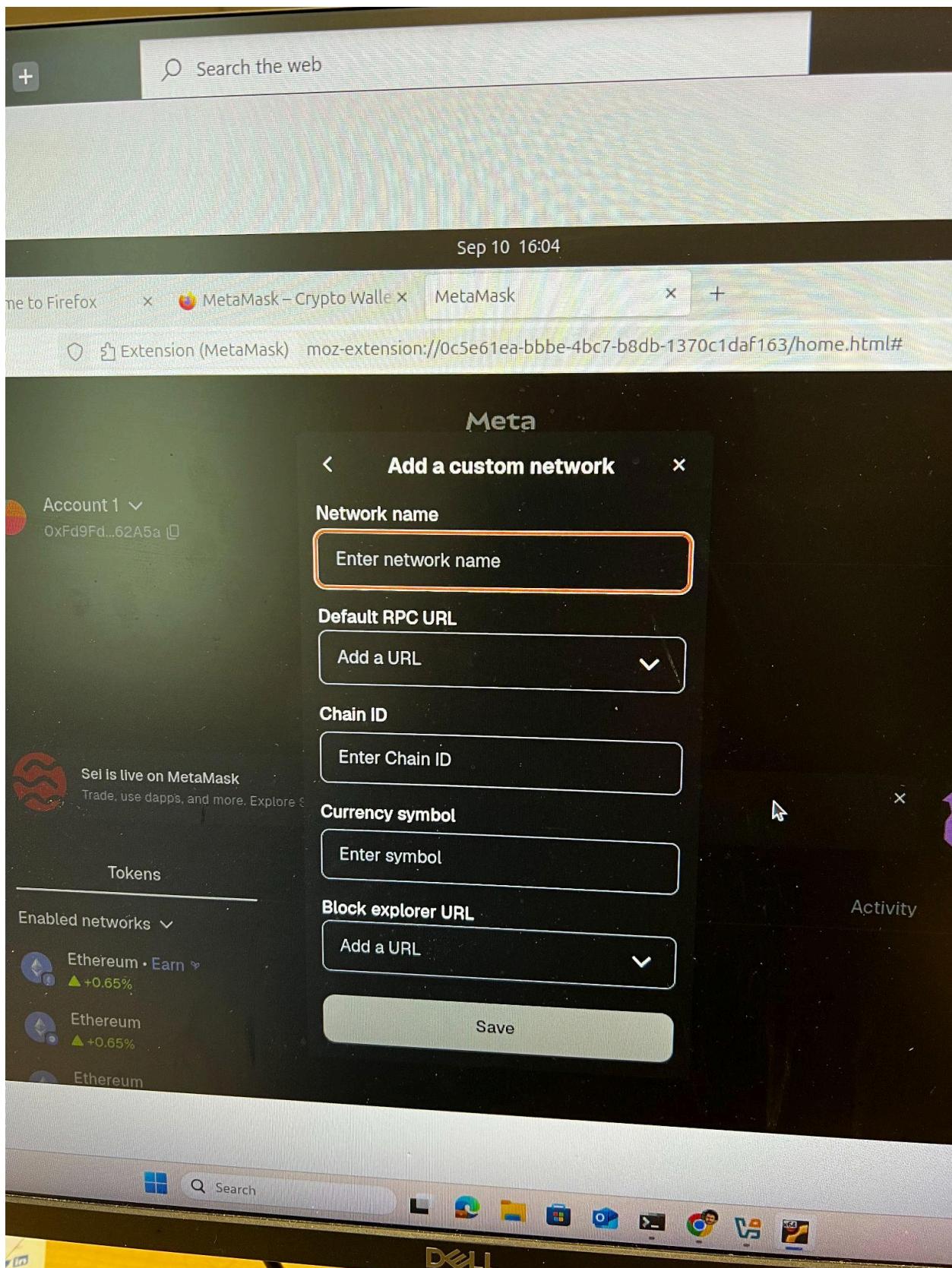


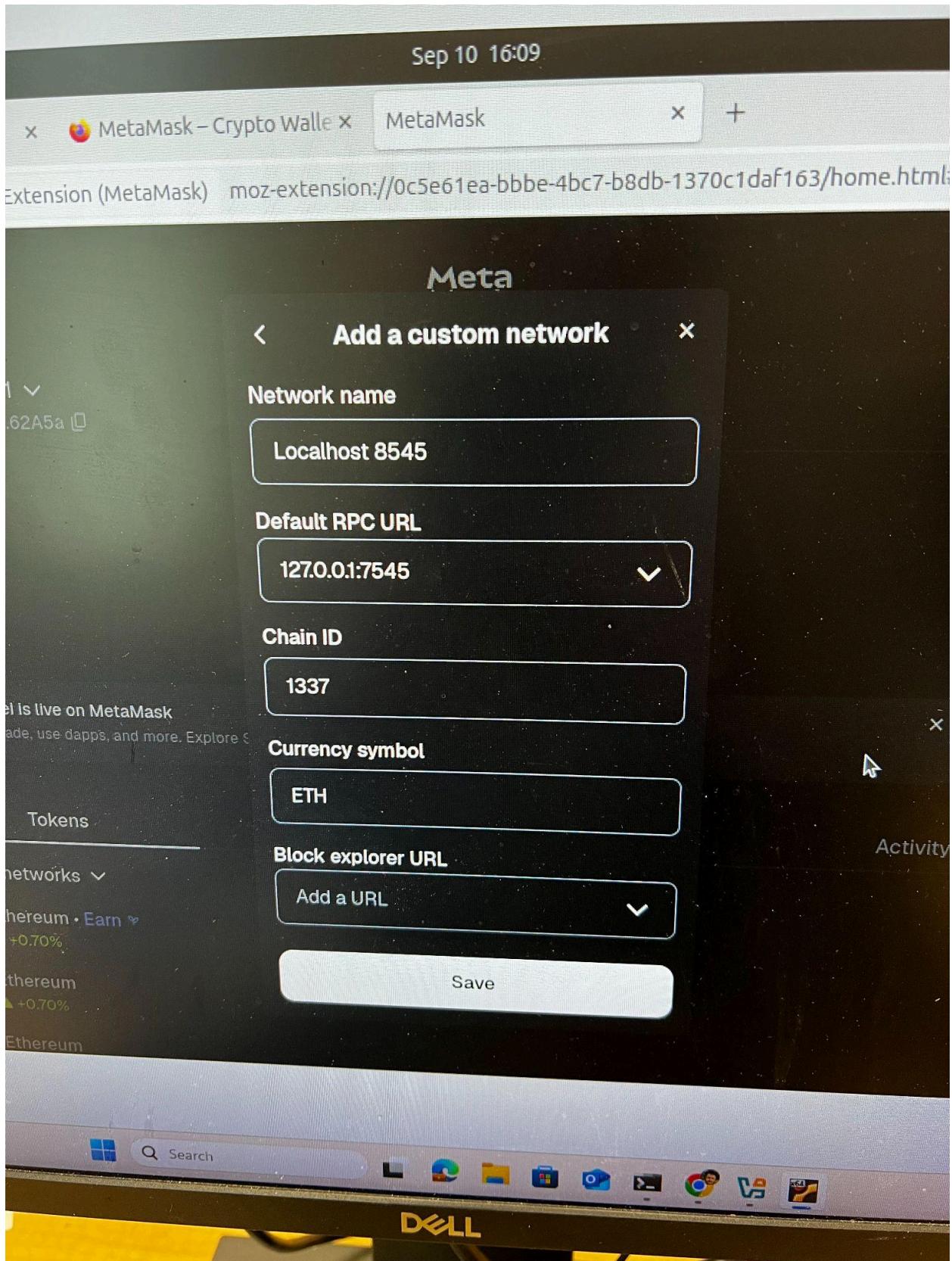
**After entering the mnemonic that is displayed in the Ganache application, the Username and password have been created**



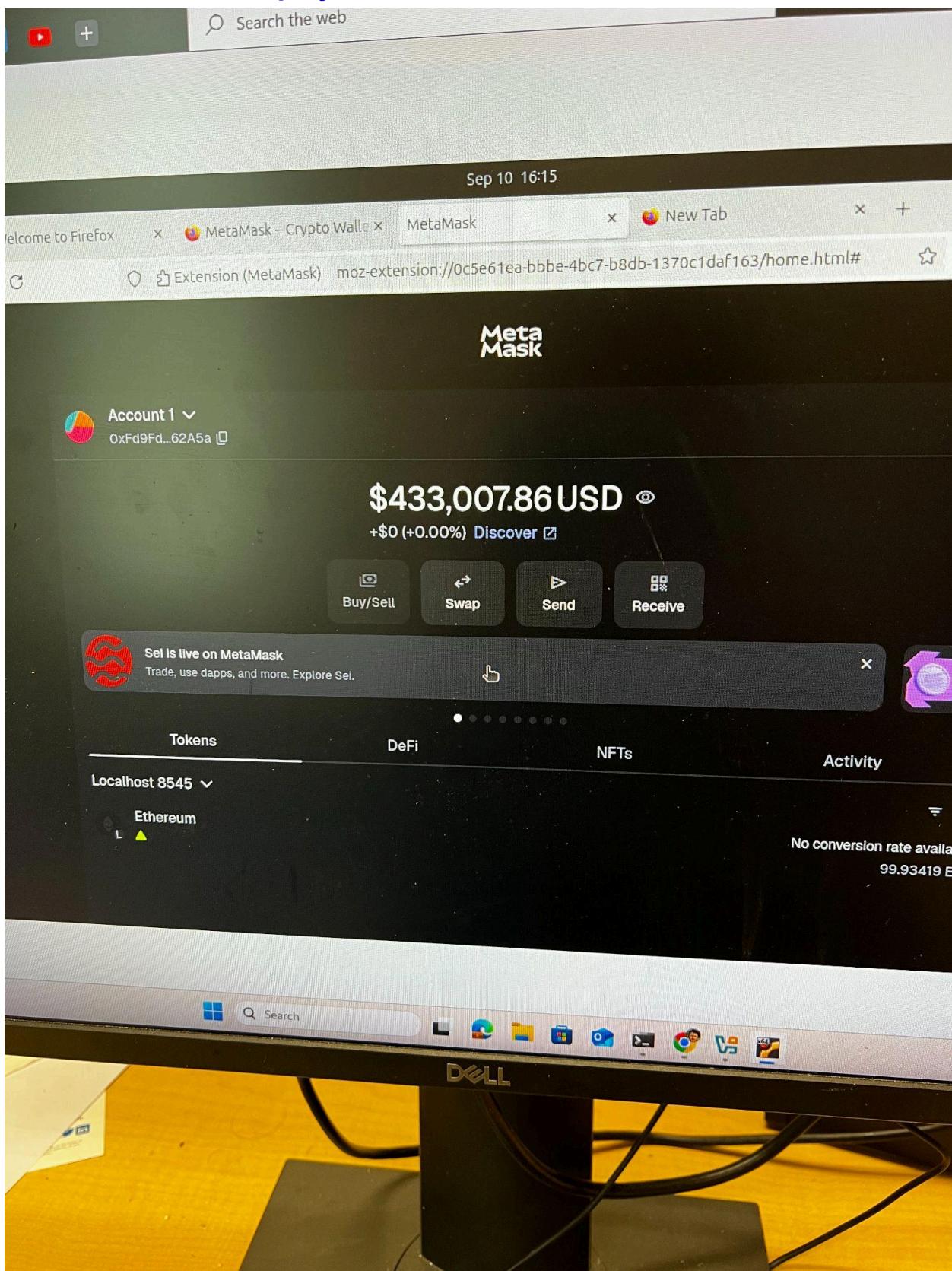


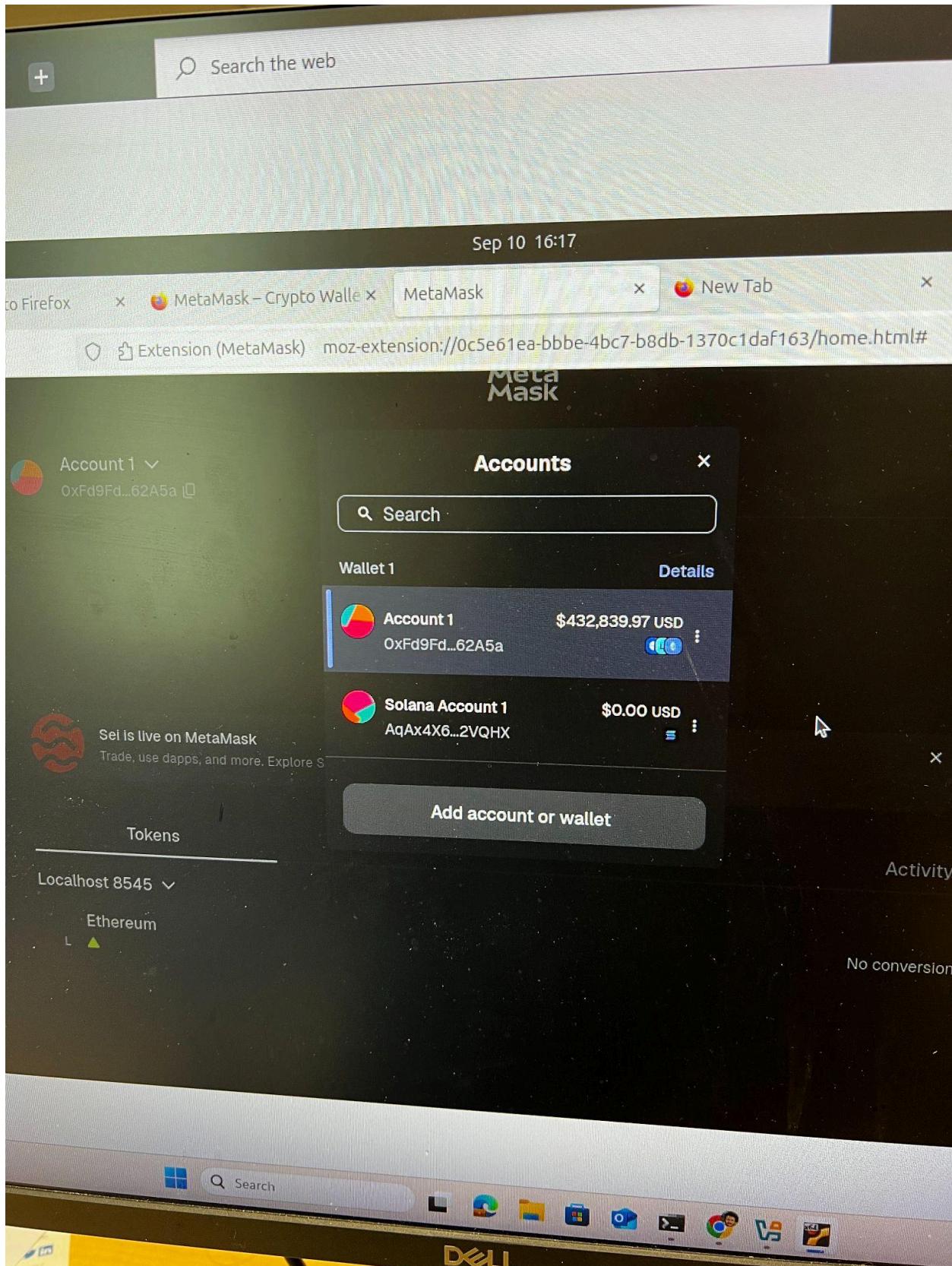
## Add a network manually





## Account balance displayed





**Using the dapp, we start the local server with the following command:  
dapp server launch, and open a new browser tab containing our dapp**

```
osboxes@Wasim: ~/gan
watchOptions: { ignored: 'node_modules' },
server: {
  baseDir: [ './src', './build/contracts' ],
  middleware: [ [Function (anonymous)], [Function (anonymous)] ]
}
[Browsersync] Access URLs:
  Local: http://localhost:3000
  External: http://10.0.2.15:3000
  UI: http://localhost:3001
  UI External: http://localhost:3001
[Browsersync] Serving files from: ./src
[Browsersync] Serving files from: ./build/contracts
[Browsersync] Watching files...
25.09.12 18:22:23 200 GET /index.html
25.09.12 18:22:27 200 GET /css/bootstrap.min.css
25.09.12 18:22:28 200 GET /js/bootstrap.min.js
25.09.12 18:22:29 200 GET /js/app.js
25.09.12 18:22:29 200 GET /js/web3.min.js
25.09.12 18:22:29 200 GET /js/truffle-contract.js
25.09.12 18:22:31 404 GET /favicon.ico
25.09.12 18:22:32 200 GET /pets.json
25.09.12 18:22:32 200 GET /images/scottish-terrier.jpeg
25.09.12 18:22:32 200 GET /images/boxer.jpeg
25.09.12 18:22:32 200 GET /images/french-bulldog.jpeg
25.09.12 18:22:32 200 GET /images/golden-retriever.jpeg
```

We are ready to make a transaction by clicking the “Adopt” button

Sep 12 18:28

Welcome to Firefox × MetaMask – Crypto × MetaMask × New Tab × Pete's Pet Shop

http://localhost:3000

# Pete's Pet Shop

 <p><b>Breed:</b> Scottish Terrier <b>Age:</b> 3 <b>Location:</b> Lisco, Alabama</p> <p><a href="#">Adopt</a></p>	 <p><b>Breed:</b> Scottish Terrier <b>Age:</b> 3 <b>Location:</b> Tooleville, West Virginia</p> <p><a href="#">Adopt</a></p>	 <p><b>Breed:</b> French Bulldog <b>Age:</b> 2 <b>Location:</b> Freeburn, Idaho</p> <p><a href="#">Adopt</a></p>	 <p><b>Breed:</b> French Bulldog <b>Age:</b> 2 <b>Location:</b> Freeburn, Idaho</p> <p><a href="#">Adopt</a></p>
 <p><b>Elaine</b></p>	 <p><b>Elvia</b></p>	 <p><b>Latisha</b></p>	 <p><b>Coleen</b></p>

Search

DELL

