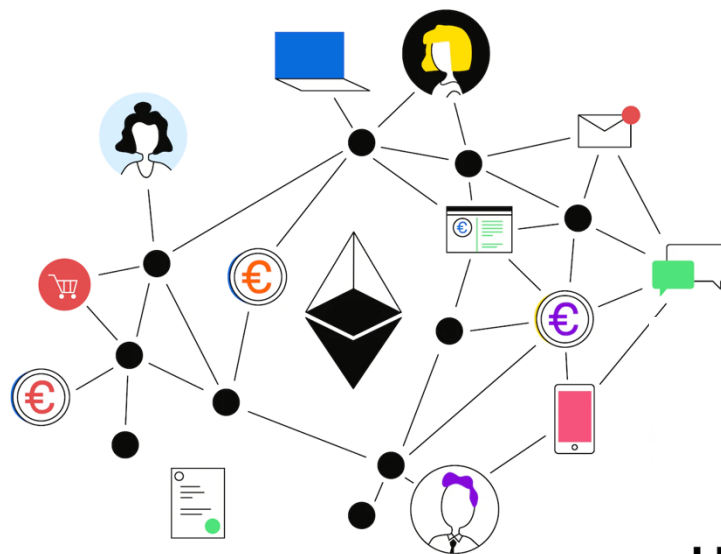


TRAVAUX PRATIQUE :

Création et configuration d'une Blockchain Privée Ethereum
(Client)



2022/2023

https://github.com/ycherifi/TP_Blockchain.git

I. Installation d'Ethereum sur Ubuntu :

Après avoir installé la machine virtuelle (ubuntu), nous allons commencer par installer ethereum.

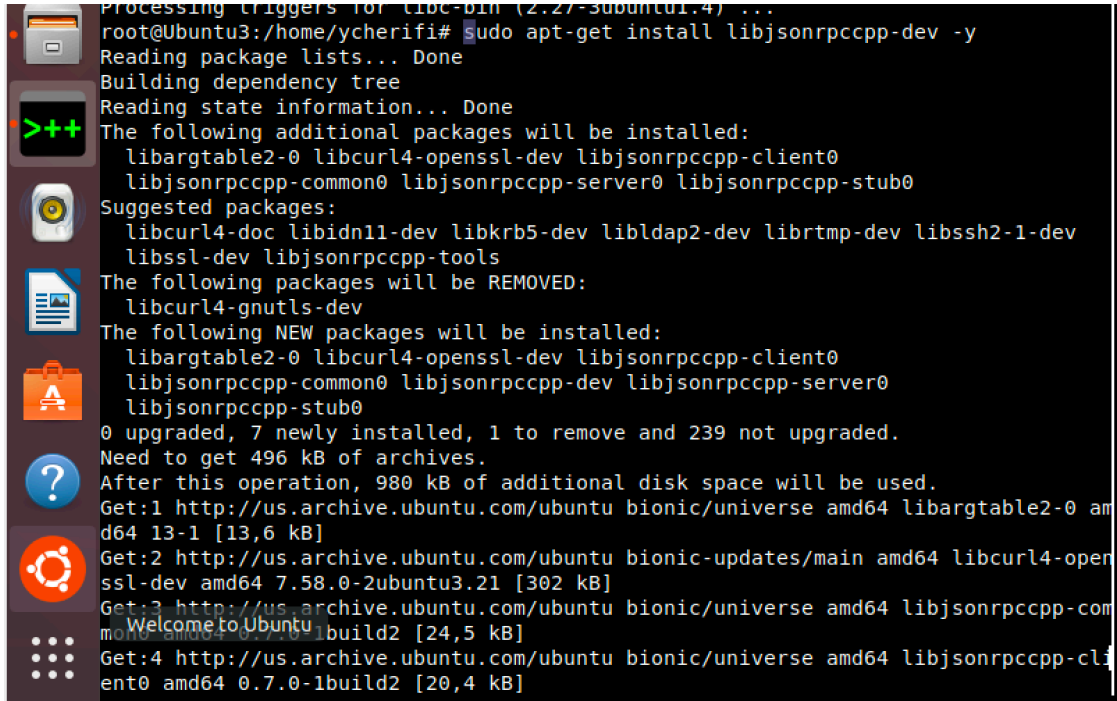
```
ycherifi@Ubuntu3:~$ su root
Password:
root@Ubuntu3:/home/ycherifi# apt-get install software-properties-common
Reading package lists... Done
Building dependency tree
Reading state information... Done
E: Unable to locate package software-properties-common
root@Ubuntu3:/home/ycherifi#
```

```
root@Ubuntu3:/home/ycherifi# sudo add-apt-repository -y ppa:ethereum/ethereum
Get:1 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic InRelease [15,4 kB]
Get:2 http://security.ubuntu.com/ubuntu bionic-security InRelease [88,7 kB]
Hit:3 http://us.archive.ubuntu.com/ubuntu bionic InRelease
Get:4 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 Packages [2 772 B]
Get:5 http://us.archive.ubuntu.com/ubuntu bionic-updates InRelease [88,7 kB]
Get:6 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main i386 Packages [2 828 B]
Get:7 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main Translation-en [828 B]
Get:8 http://us.archive.ubuntu.com/ubuntu bionic-backports InRelease [83,3 kB]
Fetched 283 kB in 1s (195 kB/s)
Reading package lists... Done
root@Ubuntu3:/home/ycherifi#
```

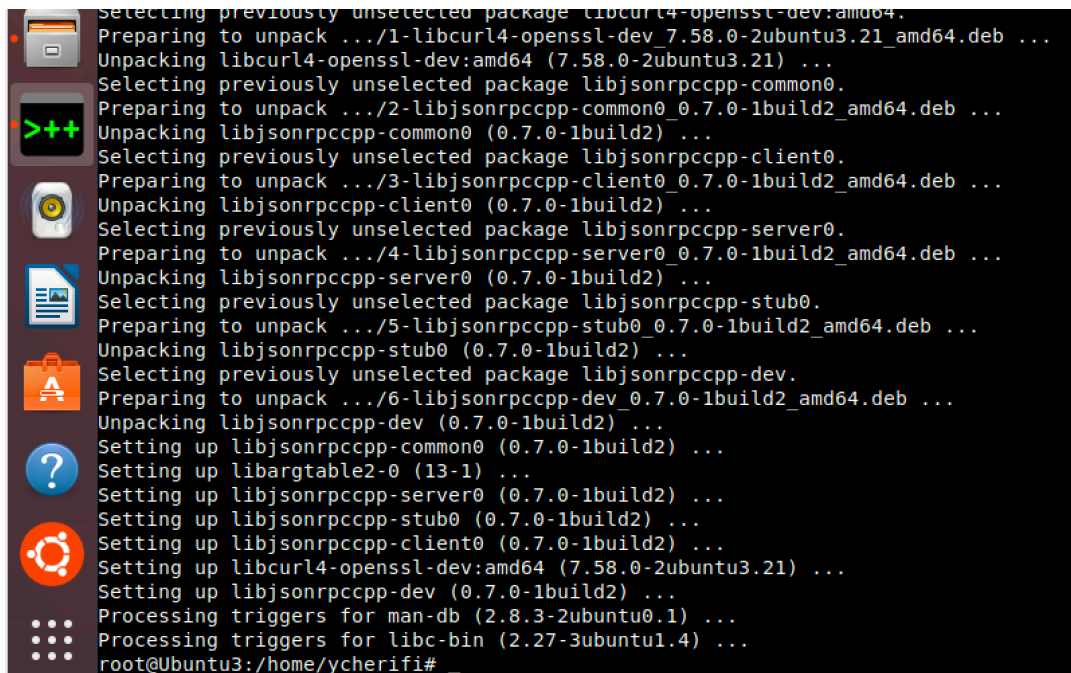
```
root@Ubuntu3: /home/ycherifi
Preparing to unpack .../5-puppeth_1.10.26+build28212+bionic_amd64.deb ...
Unpacking puppeth (1.10.26+build28212+bionic) ...
Selecting previously unselected package rlpdump.
Preparing to unpack .../6-rlpdump_1.10.26+build28212+bionic_amd64.deb ...
Unpacking rlpdump (1.10.26+build28212+bionic) ...
Selecting previously unselected package ethereum.
Preparing to unpack .../7-ethereum_1.10.26+build28212+bionic_amd64.deb ...
Unpacking ethereum (1.10.26+build28212+bionic) ...
Setting up bootnode (1.10.26+build28212+bionic) ...
Setting up puppeth (1.10.26+build28212+bionic) ...
Setting up clef (1.10.26+build28212+bionic) ...
Setting up evm (1.10.26+build28212+bionic) ...
Setting up abigen (1.10.26+build28212+bionic) ...
Setting up rlpdump (1.10.26+build28212+bionic) ...
Setting up geth (1.10.26+build28212+bionic) ...
Setting up ethereum (1.10.26+build28212+bionic) ...
root@Ubuntu3:/home/ycherifi#
root@Ubuntu3:/home/ycherifi#
root@Ubuntu3:/home/ycherifi#
```

On installe le package libjsonrpcpp-dev

```
sudo apt-get install libjsonrpcpp-dev -y
```



```
Processing triggers for libc-bin (2.27-3ubuntu1.4) ...
root@Ubuntu3:/home/ycherifi# sudo apt-get install libjsonrpcpp-dev -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libargtable2-0 libcurl4-openssl-dev libjsonrpcpp-client0
  libjsonrpcpp-common0 libjsonrpcpp-server0 libjsonrpcpp-stub0
Suggested packages:
  libcurl4-doc libidn11-dev libkrb5-dev libldap2-dev librtmp-dev libssh2-1-dev
  libssl-dev libjsonrpcpp-tools
The following packages will be REMOVED:
  libcurl4-gnutls-dev
The following NEW packages will be installed:
  libargtable2-0 libcurl4-openssl-dev libjsonrpcpp-client0
  libjsonrpcpp-common0 libjsonrpcpp-dev libjsonrpcpp-server0
  libjsonrpcpp-stub0
0 upgraded, 7 newly installed, 1 to remove and 239 not upgraded.
Need to get 496 kB of archives.
After this operation, 980 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu bionic/universe amd64 libargtable2-0 am
d64 13-1 [13,6 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libcurl4-ope
ssl-dev amd64 7.58.0-2ubuntu3.21 [302 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu bionic/universe amd64 libjsonrpcpp-com
mon0 amd64 0.7.0-1build2 [24,5 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu bionic/universe amd64 libjsonrpcpp-cl
ient0 amd64 0.7.0-1build2 [20,4 kB]
```



```
Selecting previously unselected package libcurl4-openssl-dev:amd64.
Preparing to unpack .../1-libcurl4-openssl-dev_7.58.0-2ubuntu3.21_amd64.deb ...
Unpacking libcurl4-openssl-dev:amd64 (7.58.0-2ubuntu3.21) ...
Selecting previously unselected package libjsonrpcpp-common0.
Preparing to unpack .../2-libjsonrpcpp-common0_0.7.0-1build2_amd64.deb ...
Unpacking libjsonrpcpp-common0 (0.7.0-1build2) ...
Selecting previously unselected package libjsonrpcpp-client0.
Preparing to unpack .../3-libjsonrpcpp-client0_0.7.0-1build2_amd64.deb ...
Unpacking libjsonrpcpp-client0 (0.7.0-1build2) ...
Selecting previously unselected package libjsonrpcpp-server0.
Preparing to unpack .../4-libjsonrpcpp-server0_0.7.0-1build2_amd64.deb ...
Unpacking libjsonrpcpp-server0 (0.7.0-1build2) ...
Selecting previously unselected package libjsonrpcpp-stub0.
Preparing to unpack .../5-libjsonrpcpp-stub0_0.7.0-1build2_amd64.deb ...
Unpacking libjsonrpcpp-stub0 (0.7.0-1build2) ...
Selecting previously unselected package libjsonrpcpp-dev.
Preparing to unpack .../6-libjsonrpcpp-dev_0.7.0-1build2_amd64.deb ...
Unpacking libjsonrpcpp-dev (0.7.0-1build2) ...
Setting up libjsonrpcpp-common0 (0.7.0-1build2) ...
Setting up libargtable2-0 (13-1) ...
Setting up libjsonrpcpp-server0 (0.7.0-1build2) ...
Setting up libjsonrpcpp-stub0 (0.7.0-1build2) ...
Setting up libjsonrpcpp-client0 (0.7.0-1build2) ...
Setting up libcurl4-openssl-dev:amd64 (7.58.0-2ubuntu3.21) ...
Setting up libjsonrpcpp-dev (0.7.0-1build2) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for libc-bin (2.27-3ubuntu1.4) ...
root@Ubuntu3:/home/ycherifi# _
```

II. Création de comptes pour le réseau privé Ethereum

Dans un premier temps on crée un répertoire qui se nomme **private-ethereum** avec la commande **mkdir**, ensuite on se place dans ce répertoire grâce à la commande **cd private-ethereum/**

```
root@Ubuntu3: /home/ycherifi/private-ethereum
ycherifi@Ubuntu3:~$ su
Password:
root@Ubuntu3:/home/ycherifi# mkdir private-ethereum
root@Ubuntu3:/home/ycherifi# cd private-ethereum/
```

- Création d'un nouveau compte :

On crée un nouveau compte **geth --datadir data account new**. Et on lui attribue un mot de passe qu'il faut mémoriser.

Voici le compte 1 :

```
root@Ubuntu3:/home/ycherifi/private-ethereum# mkdir private-ethereum
root@Ubuntu3:/home/ycherifi/private-ethereum# geth --datadir data account new
INFO [11-04|15:23:34.263] Maximum peer count          ETH=50 LES=0
otal=50
INFO [11-04|15:23:34.267] Smartcard socket not found, disabling  err="stat /run
/pcscd/pcscd.comm: no such file or directory"
Your new account is locked with a password. Please give a password. Do not forget
this password.
Password:
Repeat password:
Your new key was generated

Public address of the key: 0xC983657601cB9083faA88eE4A2C2a205B0042a34
Path of the secret key file: data/keystore/UTC--2022-11-04T14-24-17.274120492Z--c
983657601cb9083faa88ee4a2c2a205b0042a34

- You can share your public address with anyone. Others need it to interact with
you.
- You must NEVER share the secret key with anyone! The key controls access to you
r funds!
- You must BACKUP your key file! Without the key, it's impossible to access accou
nt funds!
- You must REMEMBER your password! Without the password, it's impossible to decry
pt the key!
```

L'adresse publique
de la clé générée

On peut également créer un second compte avec la commande précédemment.

Vérification de la liste des comptes créés avec la commande : `geth --datadir data account list`

```
root@Ubuntu3: /home/ycherifi/private-ethereum
root@Ubuntu3:/home/ycherifi/private-ethereum# geth --datadir data account list
INFO [11-06|08:23:29.746] Maximum peer count          ETH=50 LES=0 total=50
INFO [11-06|08:23:29.746] Smartcard socket not found, disabling err="stat /run/udev/data/c10900:error=0
/pccscd/pccscd.comm: no such file or directory"
WARN [11-06|08:23:29.748] Sanitizing cache to Go's GC limits provided=1024 updated=662
INFO [11-06|08:23:29.748] Set global gas cap          cap=50,000,000
Account #0: {c983657601cb9083faa88ee4a2c2a205b0042a34} keystore:///home/ycherifi/private-ethereum/data/keystore/UTC--2022-11-04T14-24-17.274120492Z--c983657601cb9083faa88ee4a2c2a205b0042a34
Account #1: {c239d79d3df2972a9889205050ede0c200496ec5} keystore:///home/ycherifi/private-ethereum/data/keystore/UTC--2022-11-04T14-35-00.263647339Z--c239d79d3df2972a9889205050ede0c200496ec5
root@Ubuntu3:/home/ycherifi/private-ethereum#
```

Nous pouvons voir les deux comptes que nous avons créés : account0 et 1.

III. Création du Genesis.

On crée le fichier `genesis.json` avec la commande nano. Et le modifie

On insère notre **chainID** : **202201** qui sert de protection ainsi que les **2 adresses des comptes créés par le serveur**.

```
Activities terminalpp mer. 16:17
root@Ubuntu3: /home/ycherifi/private-ethereum
GNU nano 2.9.3 genesis.json Modified
{
  "config": {
    "chainId": 202201,
    "homesteadBlock": 0,
    "eip150Block": 0,
    "eip155Block": 0,
    "eip158Block": 0,
    "byzantiumBlock": 0,
    "constantinopleBlock": 0,
    "petersburgBlock": 0,
    "ethash": {}
  },
  "difficulty": "1",
  "gasLimit": "8000000",
  "alloc": {
    "e726f7ac3ebc68361518f469c91c4a33b72a1094": { "balance": "3000000000000000000000" },
    "a905efe749794504156e3bbe8850ed08839de396": { "balance": "3000000000000000000000" }
  }
}
```

IV. Configuration du Bootnode.

Afin qu'un nœud puisse rejoindre le réseau et trouver d'autres nœuds nous allons créer le bootnode grâce à ces différentes commandes.

```
root@Ubuntu3:/home/ycherifi/private-ethereum# bootnode
```

```
root@Ubuntu3:/home/ycherifi/private-ethereum# bootnode --genkey=boot.key
```

```
root@Ubuntu3:/home/ycherifi/private-ethereum# bootnode --genkey=boot.key
```

```
root@Ubuntu3:/home/ycherifi/private-ethereum# bootnode --nodekey=boot.key
enode://1b14fbc4fbc2afc2157a96dfec06b38b45ddd315e52a6f11e4f8721e3155f97abd8cf5500
4bab5499a9fc933f06659bf6802bb22d5cea1f5926d94ebefa5ae1e@127.0.0.1:0?discport=3030
1
Note: you're using cmd/bootnode, a developer tool.
We recommend using a regular node as bootstrap node for production deployments.
INFO [11-17|10:07:31.897] New local node record                      seq=1,668,676,
051,894 id=ba85e32ed8b75a52 ip=<nil> udp=0 tcp=0
```

V. Démarrage des nœuds serveur avec les clients.

Une fois que bootnode sont créé, nous allons écrire cette commande en renseignant :

- **chainelD** (202201)
- **Enode** :
- <enode://98ae4fefba9420f1a49a84c373fc9cfcf10ed71d6bbbd48d64520121bec5dd469a51dde5d37c5e495ccb544d2adcca177e204d17dc2d0ca3169cda21a040785@64.227.65.43:30303>
-
- **Adresse IP du server & port** : 64.227.65.43 **port** :30303

```
geth --networkid chainelD --datadir data --bootnodes enode fournie par le
serveur@ adresse ip du serveur :port console
```

```
> net.listening
```



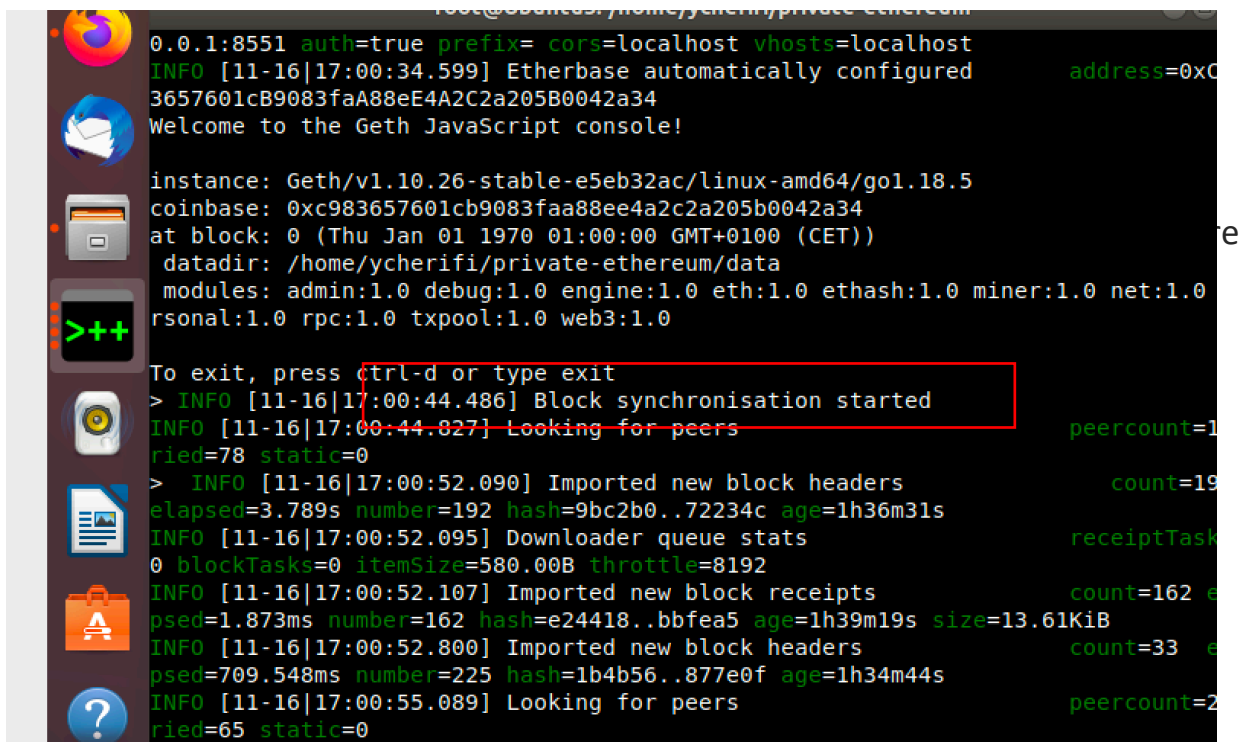
```
Activities terminalpp mer. 17:19
root@Ubuntu3: /home/ycherifi/private-ethereum

root@Ubuntu3:/home/ycherifi/private-ethereum# geth --networkid 202201 --datadir d
ata --bootnodes enode://98ae4fefba9420f1a49a84c373fc9cfcf10ed71d6bbbbb48d64520123
bec5dd469a51dde5d37c5e495ccb544d2adcca177e204d17dc2d0ca3169cda21a040785@64.227.65
.43:30303 console
INFO [11-16|17:11:05.924] Maximum peer count ETH=50 LES=0 t
otal=50
INFO [11-16|17:11:05.929] Smartcard socket not found, disabling err="stat /run
/pcscd/pcscd.comm: no such file or directory"
WARN [11-16|17:11:05.940] Sanitizing cache to Go's GC limits provided=1024
updated=662
INFO [11-16|17:11:05.940] Set global gas cap cap=50,000,000
INFO [11-16|17:11:05.944] Allocated trie memory caches clean=99.00MiB
dirty=165.00MiB
INFO [11-16|17:11:05.949] Allocated cache and file handles database=/home
/ycherifi/private-ethereum/data/GETH/chaindata cache=329.00MiB handles=524,288
INFO [11-16|17:11:06.074] Opened ancient database database=/home
/ycherifi/private-ethereum/data/GETH/chaindata/ancient/chaindata readonly=false
INFO [11-16|17:11:06.075]
INFO [11-16|17:11:06.075] -----
-----
INFO [11-16|17:11:06.075] Chain ID: 202201 (unknown)
INFO [11-16|17:11:06.075] Consensus: Ethash (proof-of-work)
INFO [11-16|17:11:06.075]
```

Nous pouvons voir que la synchronisation a bien commencé et le téléchargement des premiers blocks a commencé.

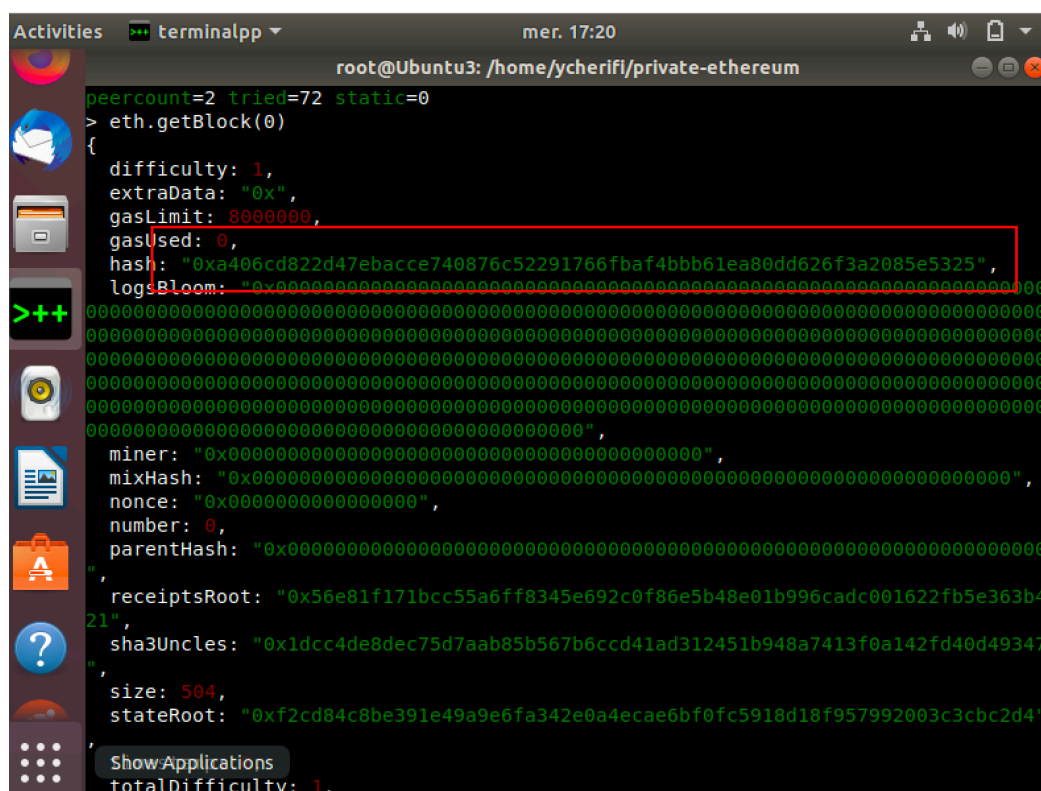
```
les terminalpp mer. 16:16
root@Ubuntu3: /home/ycherifi/private-ethereum

INFO [11-16|16:15:36.811] Maximum peer count ETH=50 LES=0 t
otal=50
INFO [11-16|16:15:36.813] Smartcard socket not found, disabling err="stat /run
/pcscd/pcscd.comm: no such file or directory"
WARN [11-16|16:15:36.832] Sanitizing cache to Go's GC limits provided=1024
updated=662
INFO [11-16|16:15:36.833] Set global gas cap cap=50,000,000
INFO [11-16|16:15:36.837] Allocated cache and file handles database=/home
/ycherifi/private-ethereum/data/GETH/chaindata cache=16.00MiB handles=16
INFO [11-16|16:15:36.900] Opened ancient database database=/home
/ycherifi/private-ethereum/data/GETH/chaindata/ancient/chaindata readonly=false
INFO [11-16|16:15:36.900] Writing custom genesis block
INFO [11-16|16:15:36.904] Persisted trie from memory database nodes=3 size=4
09.00B time="69.959µs" gcnodes=0 gcsiz=0.00B gctime=0s livenodes=1 livesize=0.00
B
INFO [11-16|16:15:36.904] Freezer shutting down
INFO [11-16|16:15:36.904] Successfully wrote genesis state database=chain
data hash=a406cd..5e5325
INFO [11-16|16:15:36.904] Allocated cache and file handles database=/home
/ycherifi/private-ethereum/data/GETH/lightchaindata cache=16.00MiB handles=16
INFO [11-16|16:15:36.949] Opened ancient database database=/home
/ycherifi/private-ethereum/data/GETH/lightchaindata/ancient/chaindata readonly=false
INFO [11-16|16:15:36.949] Writing custom genesis block
INFO [11-16|16:15:36.950] Persisted trie from memory database nodes=3 size=4
09.00B time="63.711µs" gcnodes=0 gcsiz=0.00B gctime=0s livenodes=1 livesize=0.00
B
INFO [11-16|16:15:36.950] Freezer shutting down
INFO [11-16|16:15:36.950] Successfully wrote genesis state database=light
chaindata hash=a406cd..5e5325
root@Ubuntu3:/home/ycherifi/private-ethereum#
```



Maintenant, Vérifions que les deux premiers blocks sont identiques à celle de notre Blockchain Privée sur le server avec la commande suivante : `eth.getBlock(0)` et `eth.getBlock(1)`

Block 0 :

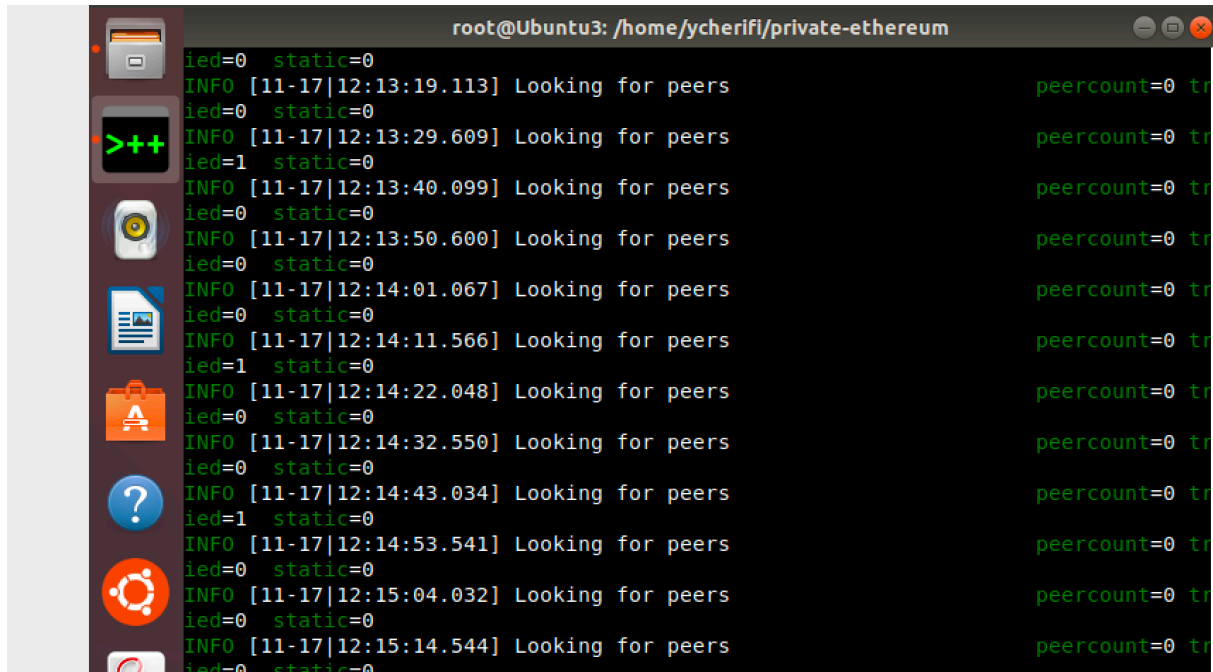


[illegible]

Ensuite nous allons vérifier si nous avons bien créé un compte avec la commande : **eth.accounts**

[illegible]

Mais après plusieurs minutes d'attente rien ne se passe !

A terminal window titled 'root@Ubuntu3: /home/ycherifi/private-ethereum' displays a series of log messages. The messages are repeated every 10 seconds, showing the node's status and its search for peers. The status is consistently 'ied=0 static=0' and the peer count is 'peercount=0'. The log messages are: 'INFO [11-17|12:13:19.113] Looking for peers', 'INFO [11-17|12:13:29.609] Looking for peers', 'INFO [11-17|12:13:40.099] Looking for peers', 'INFO [11-17|12:13:50.600] Looking for peers', 'INFO [11-17|12:14:01.067] Looking for peers', 'INFO [11-17|12:14:11.566] Looking for peers', 'INFO [11-17|12:14:22.048] Looking for peers', 'INFO [11-17|12:14:32.550] Looking for peers', 'INFO [11-17|12:14:43.034] Looking for peers', 'INFO [11-17|12:14:53.541] Looking for peers', 'INFO [11-17|12:15:04.032] Looking for peers', and 'INFO [11-17|12:15:14.544] Looking for peers'. The terminal window has a sidebar with various application icons on the left and standard window controls on the right.

```
root@Ubuntu3: /home/ycherifi/private-ethereum
ied=0 static=0
INFO [11-17|12:13:19.113] Looking for peers peercount=0 tr
ied=0 static=0
INFO [11-17|12:13:29.609] Looking for peers peercount=0 tr
ied=1 static=0
INFO [11-17|12:13:40.099] Looking for peers peercount=0 tr
ied=0 static=0
INFO [11-17|12:13:50.600] Looking for peers peercount=0 tr
ied=0 static=0
INFO [11-17|12:14:01.067] Looking for peers peercount=0 tr
ied=0 static=0
INFO [11-17|12:14:11.566] Looking for peers peercount=0 tr
ied=1 static=0
INFO [11-17|12:14:22.048] Looking for peers peercount=0 tr
ied=0 static=0
INFO [11-17|12:14:32.550] Looking for peers peercount=0 tr
ied=0 static=0
INFO [11-17|12:14:43.034] Looking for peers peercount=0 tr
ied=1 static=0
INFO [11-17|12:14:53.541] Looking for peers peercount=0 tr
ied=0 static=0
INFO [11-17|12:15:04.032] Looking for peers peercount=0 tr
ied=0 static=0
INFO [11-17|12:15:14.544] Looking for peers peercount=0 tr
ied=0 static=0
```