

## **TP BLOCKCHAIN**

### **Création et configuration d'une Blockchain Privée Ethereum**

**Cindy MUTHUKRISHNAN**

**A3MSI**

## I) Installation d'Ethereum sur Ubuntu

Nous réalisons les commandes suivantes afin d'installer Ethereum :

```
cindy@cindy-VirtualBox:~$ sudo apt-get install software-properties-common
[sudo] password for cindy:
Sorry, try again.
[sudo] password for cindy:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  python3-software-properties software-properties-gtk
The following packages will be upgraded:
  python3-software-properties software-properties-common
  software-properties-gtk
3 upgraded, 0 newly installed, 0 to remove and 252 not upgraded.
Need to get 98,7 kB of archives.
After this operation, 14,3 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://fr.archive.ubuntu.com/ubuntu bionic-updates/main amd64 software-pr
operties-common all 0.96.24.32.18 [10,1 kB]
Get:2 http://fr.archive.ubuntu.com/ubuntu bionic-updates/main amd64 software-pr
operties-gtk all 0.96.24.32.18 [64,9 kB]
Get:3 http://fr.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python3-sof
twaTerminal properties all 0.96.24.32.18 [23,8 kB]
Fetched 98,7 kB in 2s (59,7 kB/s)
(Reading database ... 127404 files and directories currently installed.)
Preparing to unpack .../software-properties-common_0.96.24.32.18_all.deb ...
Unpacking software-properties-common (0.96.24.32.18) over (0.96.24.32.14) ...
```

```

cindy@cindy-VirtualBox:~$ sudo add-apt-repository -y ppa:ethereum/ethereum
Hit:1 http://fr.archive.ubuntu.com/ubuntu bionic InRelease
Get:2 http://fr.archive.ubuntu.com/ubuntu bionic-updates InRelease [88,7 kB]
Hit:3 http://security.ubuntu.com/ubuntu bionic-security InRelease
Get:4 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic InRelease [15,4
kB]
Get:5 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main i386 Packag
es [2 828 B]
Get:6 http://fr.archive.ubuntu.com/ubuntu bionic-backports InRelease [83,3 kB]
Get:7 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 Packa
ges [2 772 B]
Get:8 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main Translation
-en [828 B]
Fetched 194 kB in 4s (54,5 kB/s)
Reading package lists... Done
cindy@cindy-VirtualBox:~$ sudo apt-get update
Hit:1 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic InRelease
Hit:2 http://fr.archive.ubuntu.com/ubuntu bionic InRelease
Hit:3 http://security.ubuntu.com/ubuntu bionic-security InRelease
Get:4 http://fr.archive.ubuntu.com/ubuntu bionic-updates InRelease [88,7 kB]
Get:5 http://fr.archive.ubuntu.com/ubuntu bionic-backports InRelease [83,3 kB]
Fetched 172 kB in 16s (10,6 kB/s)
Reading package lists... Done

```

```

cindy@cindy-VirtualBox:~$ sudo apt-get install ethereum
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  abigen bootnode clef evm geth puppeth rlpdump
The following NEW packages will be installed:
  abigen bootnode clef ethereum evm geth puppeth rlpdump
0 upgraded, 8 newly installed, 0 to remove and 252 not upgraded.
Need to get 31,3 MB of archives.
After this operation, 108 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 abige
n amd64 1.10.26+build28212+bionic [3 489 kB]
Get:2 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 bootn
ode amd64 1.10.26+build28212+bionic [3 149 kB]
Get:3 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 clef
amd64 1.10.26+build28212+bionic [8 395 kB]
Get:4 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 evm a
md64 1.10.26+build28212+bionic [3 602 kB]
Get:5 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 geth
amd64 1.10.26+build28212+bionic [8 539 kB]
Get:6 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 puppe
th amd64 1.10.26+build28212+bionic [3 446 kB]
Get:7 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 rlpdu
mp amd64 1.10.26+build28212+bionic [645 kB]
Get:8 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic/main amd64 ether
eum amd64 1.10.26+build28212+bionic [1 616 B]
Fetched 31.3 MB in 1min 16s (411 kB/s)

```

```

cindy@cindy-VirtualBox:~$ sudo apt-get install git cmake libleveldb-dev libjson
cpp-dev libboost-all-dev libgmp-dev libreadline-dev libcurl4-gnutls-dev ocl-icd
-libopencl1 opencl-headers mesa-common-dev libmicrohttpd-dev build-essential -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  autotools-dev cmake-data dh-python dpkg-dev fakeroot g++ g++-7 gcc gcc-7
  gir1.2-harfbuzz-0.0 git-man ibverbs-providers icu-devtools
  libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl
  libasan4 libatomic1 libboost-atomic-dev libboost-atomic1.65-dev
  libboost-atomic1.65.1 libboost-chrono-dev libboost-chrono1.65-dev
  libboost-chrono1.65.1 libboost-container-dev libboost-container1.65-dev
  libboost-container1.65.1 libboost-context-dev libboost-context1.65-dev
  libboost-context1.65.1 libboost-coroutine-dev libboost-coroutine1.65-dev
  libboost-coroutine1.65.1 libboost-date-time-dev libboost-date-time1.65-dev
  libboost-dev libboost-exception-dev libboost-exception1.65-dev
  libboost-fiber-dev libboost-fiber1.65-dev libboost-fiber1.65.1
  libboost-filesystem-dev libboost-filesystem1.65-dev libboost-graph-dev
  libboost-graph-parallel-dev libboost-graph-parallel1.65-dev
  libboost-graph-parallel1.65.1 libboost-graph1.65-dev libboost-graph1.65.1
  libboost-iostreams-dev libboost-iostreams1.65-dev libboost-locale-dev
  libboost-locale1.65-dev libboost-log-dev libboost-log1.65-dev
  libboost-log1.65.1 libboost-math-dev libboost-math1.65-dev
  libboost-math1.65.1 libboost-mpi-dev libboost-mpi-python-dev
  libboost-mpi-python1.65-dev libboost-mpi-python1.65.1 libboost-mpi1.65-dev
  libboost-mpi1.65.1 libboost-numpy-dev libboost-numpy1.65-dev

```

## II) Création de comptes pour le réseau privé Ethereum

On crée ensuite un répertoire pour notre réseau privé

```

cindy@cindy-VirtualBox:~$ mkdir private-ethereum2
cindy@cindy-VirtualBox:~$ cd private-ethereum2
cindy@cindy-VirtualBox:~/private-ethereum2$ geth --datadir data account new
INFO [11-16|17:13:32.570] Maximum peer count          ETH=50 LES=0
total=50
INFO [11-16|17:13:32.570] Smartcard socket not found, disabling  err="stat /r
un/pcscd/pcscd.comm: no such file or directory"

```

Après on crée deux comptes wallet :

```

cindy@cindy-VirtualBox:~/private-ethereum2$ geth --datadir data account new
INFO [11-16|17:13:48.646] Maximum peer count          ETH=50 LES=0
total=50
INFO [11-16|17:13:48.647] Smartcard socket not found, disabling  err="stat /r
un/pcscd/pcscd.comm: no such file or directory"
Your new account is locked with a password. Please give a password. Do not forg
ot this password.

```

Grâce à la commande ci-dessous, on observe bien la création des deux comptes avec leurs adresses.

```
cindy@cindy-VirtualBox:~/private-ethereum2$ geth --datadir data account list
INFO [11-16|17:14:16.407] Maximum peer count           ETH=50 LES=0
total=50
INFO [11-16|17:14:16.407] Smartcard socket not found, disabling   err="stat /run/pcscd/pcscd.comm: no such file or directory"
WARN [11-16|17:14:16.415] Sanitizing cache to Go's GC limits      provided=1024 updated=662
INFO [11-16|17:14:16.416] Set global gas cap                     cap=50,000,000
Account #0: {d528027ab46f76700e7b5e59326132b37ba52b03} keystore:///home/cindy/private-ethereum2/data/keystore/UTC--2022-11-16T16-13-41.519374503Z--d528027ab46f76700e7b5e59326132b37ba52b03
Account #1: {29d4e8baafe915709492069d00d4040065882442} keystore:///home/cindy/private-ethereum2/data/keystore/UTC--2022-11-16T16-13-55.901401742Z--29d4e8baafe915709492069d00d4040065882442
cindy@cindy-VirtualBox:~/private-ethereum2$
```

### III) Configuration du Bootnode uniquement sur le serveur dans un premier temps

On instancie un nœud :

```
cindy@cindy-VirtualBox:~/private-ethereum2$ bootnode
Fatal: Use -nodekey or -nodekeyhex to specify a private key
cindy@cindy-VirtualBox:~/private-ethereum2$ bootnode --genkey=boot.key
cindy@cindy-VirtualBox:~/private-ethereum2$ bootnode --nodekey=boot.key
enode://8776e543d91e90a9ea3cfa23900f6984ad1a8868ab46a0e0420806a2ba10bb98f32d0c5b53062a2c0536f1ad6e819651da21f8db09f8d09db7b49394fa423341@127.0.0.1:0?discport=30301
NoRhythmbox using cmd/bootnode, a developer tool.
We recommend using a regular node as bootstrap node for production deployments.
INFO [11-16|17:20:14.554] New local node record                seq=1,668,615,614,545 id=8ba98723d32abc15 ip=<nil> udp=0 tcp=0
```

```
cindy@cindy-VirtualBox:~/private-ethereum2$ bootnode --nodekey=boot.key --write address
8776e543d91e90a9ea3cfa23900f6984ad1a8868ab46a0e0420806a2ba10bb98f32d0c5b53062a2c0536f1ad6e819651da21f8db09f8d09db7b49394fa423341
```

### IV) Creation du Genesis File

```
cindy@cindy-VirtualBox:~/private-ethereum2$ nano genesis.json
cindy@cindy-VirtualBox:~/private-ethereum2$ geth init --datadir data genesis.json
Fatal: invalid genesis file: invalid character 'b' looking for beginning of object key string
cindy@cindy-VirtualBox:~/private-ethereum2$ nano genesis.json
```





On instancie le répertoire de données avec la commande suivante :

```
cindy@cindy-VirtualBox:~/private-ethereum2$ geth init --datadir data genesis.js
on
INFO [11-16|17:33:28.880] Maximum peer count                      ETH=50 LES=0
total=50
INFO [11-16|17:33:28.883] Smartcard socket not found, disabling    err="stat /r
un/pcscd/pcscd.comm: no such file or directory"
WARN [11-16|17:33:28.888] Sanitizing cache to Go's GC limits       provided=102
4 updated=662
INFO [11-16|17:33:28.890] Set global gas cap                       cap=50,000,0
00
```

Affectation adresse ip au nœud

```
cindy@cindy-VirtualBox:~/private-ethereum2$ bootnode --nodekey=boot.key --addr
10.4.253.22:30301
enode://8776e543d91e90a9ea3cfa23900f6984ad1a8868ab46a0e0420806a2ba10bb98f32d0c5
b53062a2c0536f1ad6e819651da21f8db09f8d09db7b49394fa423341@10.4.253.22:0?discpor
t=30301
Note: you're using cmd/bootnode, a developer tool.
We recommend using a regular node as bootstrap node for production deployments.
INFO [11-16|17:37:04.234] New local node record                      seq=1,668,61
5,624,229 id=8ba98723d32abc15 ip=<nil> udp=0 tcp=0
```

Réalisation de la commande côté client

```
cindy@cindy-VirtualBox:~/private-ethereum2$ geth --networkid 12345678 --datadir
data --bootnodes enode://f0c175d4ddf4432e3e915e4d5d1137f5073853a3d5ceeffe627a7
81a5dff1dc4f97412ba71dc1578ed29e2ee77aaa629c0eb33d65d0a970fabaa92c3691d19d8@64.
225.66.111:30303 console
INFO [11-16|17:43:04.418] Maximum peer count                      ETH=50 LES=0
```

On peut observer que la synchronisation du bloc est bien effectuée.

```
INFO [11-16|17:43:14.552] Block synchronisation started
INFO [11-16|17:43:14.891] Looking for peers                        peercount=1
tried=229 static=0
INFO [11-16|17:43:15.891] State sync in progress                  synced=37.26
% state=196.00B accounts=1@196.00B slots=0@0.00B codes=0@0.00B eta=1.682s
INFO [11-16|17:43:16.612] Imported new block headers              count=50 ela
psed=1.642s number=50 hash=420aa3..3eb810 age=1w3d22h
INFO [11-16|17:43:16.612] Downloader queue stats                  receiptTasks
=0 blockTasks=0 itemSize=576.88B throttle=8192
INFO [11-16|17:43:17.256] Imported new chain segment              blocks=50 tx
s=0 mgas=0.000 elapsed=643.419ms mgasps=0.000 number=50 hash=420aa3..3eb810 age
=1w3d22h dirty=22.17KiB
INFO [11-16|17:43:18.130] Imported new block headers              count=2 ela
psed=12.845ms number=52 hash=84f992..be4616 age=1w3d22h
INFO [11-16|17:43:18.147] Imported new chain segment              blocks=2 tx
s=0 mgas=0.000 elapsed=16.739ms mgasps=0.000 number=52 hash=84f992..be4616 age
=1w3d22h dirty=23.05KiB
INFO [11-16|17:43:18.148] State sync in progress                  synced=75.10
% state=392.00B accounts=2@392.00B slots=0@0.00B codes=0@0.00B eta=1.079s
WARN [11-16|17:43:19.140] Synchronisation failed, continuing
```

[illegible]

La capture ci-dessous montre bien le minage.

[illegible]



[illegible]

## Bonus :

On remarque que le compte a bien reçu une transaction.

```
> eth.getBalance("0xd528027ab46f76700e7b5e59326132b37ba52b03")  
2960000000000000000  
> INFO [11-17|00:02:48.075] Looking for peers peercount=  
0 tried=5 static=0  
INFO [11-17|00:03:01.596] Looking for peers peercount=0  
tried=5 static=0  
INFO [11-17|00:03:13.618] Looking for peers peercount=0  
tried=3 static=0  
INFO [11-17|00:03:27.143] Looking for peers peercount=0  
tried=2 static=0  
INFO [11-17|00:03:39.164] Looking for peers peercount=0  
tried=2 static=0
```