

I. Installation d'Ethereum sur Ubuntu

```
[mark@UBUNTU:~$ sudo apt-get install software-properties-common
Reading package lists... Done
Building dependency tree
Reading state information... Done
software-properties-common is already the newest version (0.96.24.32.18).
software-properties-common set to manually installed.
The following package was automatically installed and is no longer required:
  linux-headers-4.15.0-194
Use 'sudo apt autoremove' to remove it.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Fetched 26.4 MB in 5s (5077 kB/s)
Reading package lists... Done
```

```
[mark@UBUNTU:~$ sudo apt-get update
Hit:1 http://azure.archive.ubuntu.com/ubuntu bionic InRelease
Hit:2 http://azure.archive.ubuntu.com/ubuntu bionic-updates InRelease
Hit:3 http://azure.archive.ubuntu.com/ubuntu bionic-backports InRelease
Hit:4 http://azure.archive.ubuntu.com/ubuntu bionic-security InRelease
Hit:5 http://ppa.launchpad.net/ethereum/ethereum/ubuntu bionic InRelease
Reading package lists... Done
```

```
[mark@UBUNTU:~$ sudo apt-get install ethereum
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  linux-headers-4.15.0-194
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  abi_gen bootnode clef evm geth puppeth rlpdump
The following NEW packages will be installed:
  abi_gen bootnode clef ethereum evm geth puppeth rlpdump
0 upgraded, 8 newly installed, 0 to remove and 21 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
```

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```
Selecting previously unselected package evm.
Preparing to unpack .../3-evm_1.10.26+build28212+bionic_amd64.deb ...
Unpacking evm (1.10.26+build28212+bionic) ...
Selecting previously unselected package geth.
Preparing to unpack .../4-geth_1.10.26+build28212+bionic_amd64.deb ...
Unpacking geth (1.10.26+build28212+bionic) ...
Selecting previously unselected package puppeth.
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) ...
Setting up libharfbuzz-dev:amd64 (1.7.2-1ubuntu1) ...
Setting up libicu-le-hb-dev:amd64 (1.0.3+git161113-4) ...
Setting up libicu-dev (60.2-3ubuntu3.2) ...
Setting up libboost-regex1.65-dev:amd64 (1.65.1+dfsg-0ubuntu5) ...
Setting up libboost-iostreams1.65-dev:amd64 (1.65.1+dfsg-0ubuntu5) ...
Setting up libboost-iostreams-dev:amd64 (1.65.1.0ubuntu1) ...
Setting up libboost-regex-dev:amd64 (1.65.1.0ubuntu1) ...
Setting up libboost-all-dev (1.65.1.0ubuntu1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for libc-bin (2.27-3ubuntu1.6) ...
```

II. Création de comptes pour le réseau privé Ethereum

```
[root@ec885f852880:~/private-ethereum# geth --datadir data account new
[INFO [11-16|14:13:28.800] Maximum peer count           ETH=50 LES=0 total=50
[INFO [11-16|14:13:28.801] 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:  0xCeeFE559b99214c9Cb1AbDbc3E1d40702992AA27
Path of the secret key file: data/keystore/UTC--2022-11-16T14-13-36.167261626Z--ceefe559b99214c9cb1abdbc3e1d40702992aa27
- 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 your funds!
- You must BACKUP your key file! Without the key, it's impossible to access account funds!
- You must REMEMBER your password! Without the password, it's impossible to decrypt the key!
```

```
[root@ec885f852880:~/private-ethereum# geth --datadir data account list
[INFO [11-16|14:15:30.487] Maximum peer count           ETH=50 LES=0 total=50
[INFO [11-16|14:15:30.488] Smartcard socket not found, disabling   err="stat /run/pcscd/pcscd.comm: no such file or directory"
[INFO [11-16|14:15:30.489] Set global gas cap          cap=50,000,000
Account #0: {ceefe559b99214c9cb1abdbc3e1d40702992aa27} keystore:///root/private-ethereum/data/keystore/UTC--2022-11-16T14-13-36.167261626Z--ceefe559b99214c9cb1abdbc3e1d40702992aa27
```

III. Création du Genesis File

Identique à celui du serveur

```
{  
  "config": {  
    "chainId": 202206,  
    "homesteadBlock": 0,  
    "eip150Block": 0,  
    "eip155Block": 0,  
    "eip158Block": 0,  
    "byzantiumBlock": 0,  
    "constantinopleBlock": 0,  
    "petersburgBlock": 0,  
    "ethash": {}  
  },  
  "difficulty": "1",  
  "gasLimit": "8000000",  
  "alloc": {  
    "0x1650fE6b63D0F25207FdFc0b45d5EFAEFe74942A": {  
      "balance": "3000000000000000000000000"  
    }  
  }  
}
```

Initialisation du fichier genesis

```
[root@ec885f852880:~/private-ethereum# geth init --datadir data genesis.json]  
INFO [11-16|14:20:59.331] Maximum peer count  
INFO [11-16|14:20:59.333] Smartcard socket not found, disabling  
INFO [11-16|14:20:59.336] Set global gas cap  
INFO [11-16|14:20:59.337] Allocated cache and file handles  
ib_handles=16  
INFO [11-16|14:20:59.352] Opened ancient database  
n_READONLY=false  
INFO [11-16|14:20:59.352] Writing custom genesis block  
INFO [11-16|14:20:59.353] Persisted trie from memory database  
me=0s livenodes=1 livesize=0.00B  
INFO [11-16|14:20:59.353] Successfully wrote genesis state  
INFO [11-16|14:20:59.353] Allocated cache and file handles  
6.00MiB handles=16  
INFO [11-16|14:20:59.364] Opened ancient database  
/chain_READONLY=false  
INFO [11-16|14:20:59.365] Writing custom genesis block  
INFO [11-16|14:20:59.365] Persisted trie from memory database  
ime=0s livenodes=1 livesize=0.00B  
INFO [11-16|14:20:59.365] Successfully wrote genesis state  
ETH=50 LES=0 total=50  
err="stat /run/pcscd/pcscd.comm: no such file or directory"  
cap=50,000,000  
database=/root/private-ethereum/data/geth/chaindata cache=16.00M  
database=/root/private-ethereum/data/geth/chaindata/ancient/chai  
nodes=1 size=148.00B time="97.292μs" gcnodes=0 gcsize=0.00B gcti  
database=chaindata hash=38bc54..19a57a  
database=/root/private-ethereum/data/geth/lightchaindata cache=1  
database=/root/private-ethereum/data/geth/lightchaindata/ancient  
nodes=1 size=148.00B time="586.334μs" gcnodes=0 gcsize=0.00B gct  
database=lightchaindata hash=38bc54..19a57a
```

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VI. Démarrage des nœuds

```
[root@ec885f852880:~/private-ethereum# geth --networkid 202206 --datadir data --bootnodes enode://d4f63b7bd0cd6460bb92c8671c1c62f0cc3070274a4d02aac405bc1ca9aa:e78f976db2489385b28ed167f79551bb153cf3c642ccccfb852104dbe827c3d5c2064.227.65.30:30303 console
INFO [11-17|08:57:38.092] Maximum peer count          ETH=50 LES=0 total=50
INFO [11-17|08:57:38.092] Smartcard socket not found, disabling    err="stat /run/pcscd/pcscd.comm: no such file or directory"
INFO [11-17|08:57:38.097] Set global gas cap           cap=50,000,000
INFO [11-17|08:57:38.099] Allocated trie memory caches   clean=154.00MiB dirty=256.00MiB
INFO [11-17|08:57:38.099] Allocated cache and file handles database=/root/private-ethereum/data/geth/chaindata cache=512.00MiB handles=524,288
INFO [11-17|08:57:38.113] Opened ancient database       database=/root/private-ethereum/data/geth/chaindata/ancient/chain readonly=false
INFO [11-17|08:57:38.113]
INFO [11-17|08:57:38.113]
```

La synchronisation a bien été effectué :

```
> INFO [11-17|08:57:48.153] Block synchronisation started
```

Observation des comptes disponibles :

```
> eth.accounts
["0xcee559b99214c9cb1abdbc3e1d40702992aa27"]
```

MINAGE :

```
> miner.start(1)
INFO [11-16|14:43:15.099] Updated mining threads          threads=1
INFO [11-16|14:43:15.099] Transaction pool price threshold updated price=1,000,000,000
null
> INFO [11-16|14:43:15.101] Commit new sealing work      number=1 sealhash=7f8c49..cc4bb...
INFO [11-16|14:43:15.102] Commit new sealing work      number=1 sealhash=7f8c49..cc4bbb...
noles=0 txs=0 gas=0 fees=0 elapsed=2.097ms
INFO [11-16|14:43:16.071] Generating DAG in progress    epoch=0 percentage=0 elapsed=502.1...
06ms
INFO [11-16|14:43:16.595] Generating DAG in progress    epoch=0 percentage=1 elapsed=1.020...
s
INFO [11-16|14:43:17.105] Generating DAG in progress    epoch=0 percentage=2 elapsed=1.530...
s
INFO [11-16|14:43:17.610] Generating DAG in progress    epoch=0 percentage=3 elapsed=2.040...
s
INFO [11-16|14:43:18.116] Generating DAG in progress    epoch=0 percentage=4 elapsed=2.540...
s
INFO [11-16|14:43:18.619] Generating DAG in progress    epoch=0 percentage=5 elapsed=3.050...
s
INFO [11-16|14:43:19.122] Generating DAG in progress    epoch=0 percentage=6 elapsed=3.550...
s
INFO [11-16|14:43:19.623] Generating DAG in progress    epoch=0 percentage=7 elapsed=4.050...
s
INFO [11-16|14:43:20.126] Generating DAG in progress    epoch=0 percentage=8 elapsed=4.550...
s
INFO [11-16|14:43:20.632] Generating DAG in progress    epoch=0 percentage=9 elapsed=5.060...
s
INFO [11-16|14:43:21.159] Generating DAG in progress    epoch=0 percentage=10 elapsed=5.560...
0s
INFO [11-16|14:43:21.668] Generating DAG in progress    epoch=0 percentage=11 elapsed=6.060...
9s
INFO [11-16|14:43:22.211] Generating DAG in progress    epoch=0 percentage=12 elapsed=6.660...
2s
INFO [11-16|14:43:22.745] Generating DAG in progress    epoch=0 percentage=13 elapsed=7.160...
6s
INFO [11-16|14:43:23.257] Generating DAG in progress    epoch=0 percentage=14 elapsed=7.660...
7s
INFO [11-16|14:43:23.758] Generating DAG in progress    epoch=0 percentage=15 elapsed=8.160...
9s
INFO [11-16|14:43:24.269] Generating DAG in progress    epoch=0 percentage=16 elapsed=8.760...
0s
INFO [11-16|14:43:24.774] Generating DAG in progress    epoch=0 percentage=17 elapsed=9.260...
4s
```

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Minage réussi :

```
INFO [11-16|14:44:10.749] Successfully sealed new block  
067d elapsed=55.644s  
INFO [11-16|14:44:10.750] ↗ mined potential block  
INFO [11-16|14:44:10.751] Commit new sealing work  
gas=0 fees=0 elapsed="339.416us"  
INFO [11-16|14:44:10.751] Commit new sealing work  
gas=0 fees=0 elapsed=1.024ms  
INFO [11-16|14:44:11.419] Generating DAG in progress  
INFO [11-16|14:44:11.834] Successfully sealed new block  
120c elapsed=1.083s  
INFO [11-16|14:44:11.834] ↗ mined potential block  
INFO [11-16|14:44:11.835] Commit new sealing work  
gas=0 fees=0 elapsed="69.834us"  
INFO [11-16|14:44:11.835] Commit new sealing work  
gas=0 fees=0 elapsed="524.709us"  
INFO [11-16|14:44:12.423] Generating DAG in progress  
INFO [11-16|14:44:13.363] Successfully sealed new block  
eb81 elapsed=1.528s  
INFO [11-16|14:44:13.363] ↗ mined potential block  
INFO [11-16|14:44:13.364] Commit new sealing work  
gas=0 fees=0 elapsed="537.791us"  
INFO [11-16|14:44:13.364] Commit new sealing work  
gas=0 fees=0 elapsed="655.375us"  
INFO [11-16|14:44:13.481] Generating DAG in progress  
INFO [11-16|14:44:14.500] Generating DAG in progress  
INFO [11-16|14:44:15.654] Generating DAG in progress  
INFO [11-16|14:44:16.758] Generating DAG in progress  
INFO [11-16|14:44:17.131] Successfully sealed new block  
afbf3 elapsed=3.767s  
INFO [11-16|14:44:17.131] ↗ mined potential block  
INFO [11-16|14:44:17.132] Commit new sealing work  
gas=0 fees=0 elapsed="136.458us"  
INFO [11-16|14:44:17.133] Commit new sealing work  
gas=0 fees=0 elapsed="623.916us"  
INFO [11-16|14:44:17.836] Generating DAG in progress
```

```
number=1 sealhash=7f8c49..cc4bbb hash=f51341..c5
number=1 hash=f51341..c5067d
number=2 sealhash=e841bd..8315f3 uncles=0 txs=0
number=2 sealhash=e841bd..8315f3 uncles=0 txs=0

epoch=1 percentage=0 elapsed=1.156s
number=2 sealhash=e841bd..8315f3 hash=75ad44..bb
number=2 hash=75ad44..bb120c
number=3 sealhash=3ea74e..1d027a uncles=0 txs=0
number=3 sealhash=3ea74e..1d027a uncles=0 txs=0

epoch=1 percentage=1 elapsed=2.160s
number=3 sealhash=3ea74e..1d027a hash=ada6fd..75
number=3 hash=ada6fd..75eb81
number=4 sealhash=8c5bf6..d8584f uncles=0 txs=0
number=4 sealhash=8c5bf6..d8584f uncles=0 txs=0

epoch=1 percentage=2 elapsed=3.218s
epoch=1 percentage=3 elapsed=4.237s
epoch=1 percentage=4 elapsed=5.391s
epoch=1 percentage=5 elapsed=6.487s
number=4 sealhash=8c5bf6..d8584f hash=ca1f86..a6
number=4 hash=ca1f86..a6afb3
number=5 sealhash=4b3d9b..04aba0 uncles=0 txs=0
number=5 sealhash=4b3d9b..04aba0 uncles=0 txs=0

epoch=1 percentage=6 elapsed=7.573s
```

BLOCK 0 (identique à celui du serveur) :

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BLOCK 793 (identique à celui du serveur) :

BONUS :

Observation de la balance avant l'envoi de la transaction

```
> eth.getBalance(eth.accounts[0])  
1.043699702999999899997e+21
```

Envoi de la transaction avec la fonction sendTransaction :

```
> eth.sendTransaction({to: '0x1650fe6b63dfe2f5207fdfc84b5d5eefae7f4942a', value: '10000000000000000000000000000000'});  
INFO [11-17|09:00:54.588] Submitted transaction  
hash=0xeb3b1dd1d42fd7fc3753a1a6b91ae2ce768438a622ccccc041ace439b8833ec52cf02 from=0xCeeF559b99  
21C49C9b1AbDdc31d40702992A27 nonce='0x1650fe6b63dfe2f5207fdfc84b5d5eefae7f4942A' value='10,000,000,000  
0xeb3b1dd1d42fd7c3753a1a6b91ae2ce768438a622ccccc041ace439b8833ec52cf02"
```

On observe bien que la balance a diminuer avec la valeur de la transaction :

```
> eth.getBalance(eth.accounts[0])
  number=1015 hash=34ef2a..349be6
```

1.043699681989999899997e+21

On peut appeler la fonction `getTransactionReceipt` pour avoir plus d'information sur la transaction grâce à son hash code :

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La balance de mes camarades :

CLIENT PC2 ROMAIN EYQUEM :

```
> eth.getBalance("0x936d6e0480daa75af96f5378392ccbc95d2eb800")  
1.20831279600001100001e+21
```

SERVEUR CYRIL FARID :

```
> eth.getBalance("0x1650fe6b63d0f25207fdfc0b45d5efaefe74942a")  
46836252200999900002
```