

Assignment 6: Setting up Private Blockchain Environment using Ethereum Platform

Question: Setup environment for private blockchain using Go-Ethereum (Geth):

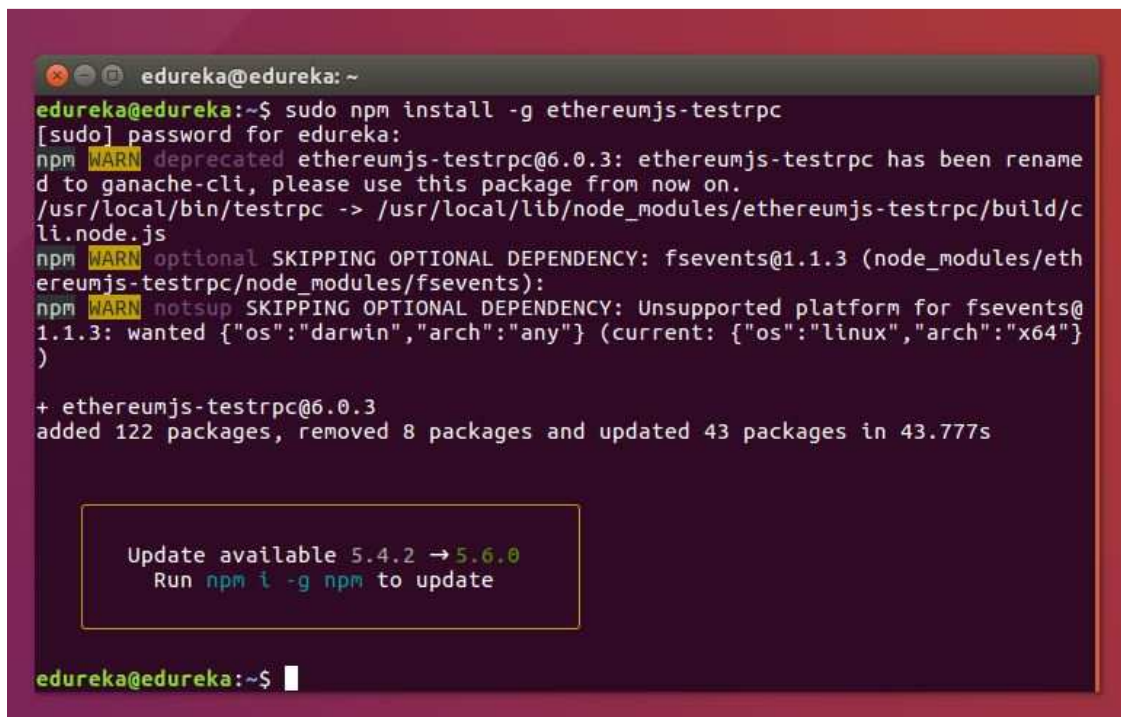
- Install and Setup Geth
- Install Go Lang. Also configure .bashrc file

Solution:

Before installing Private Blockchain, lets create or update Ethereum Node (RPC)

```
Sudo npm install -g Ethereumjs-testrpc
```

Image1: Installing Ethereumjs-testrpc



```
edureka@edureka: ~  
edureka@edureka:~$ sudo npm install -g ethereumjs-testrpc  
[sudo] password for edureka:  
npm WARN deprecated ethereumjs-testrpc@6.0.3: ethereumjs-testrpc has been rename  
d to ganache-cli, please use this package from now on.  
/usr/local/bin/testrpc -> /usr/local/lib/node_modules/ethereumjs-testrpc/build/c  
li.node.js  
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.1.3 (node_modules/eth  
ereumjs-testrpc/node_modules/fsevents):  
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@  
1.1.3: wanted {"os":"darwin","arch":"any"} (current: {"os":"linux","arch":"x64"}  
)  
  
+ ethereumjs-testrpc@6.0.3  
added 122 packages, removed 8 packages and updated 43 packages in 43.777s  
  
Update available 5.4.2 → 5.6.0  
Run npm i -g npm to update  
  
edureka@edureka:~$
```

After updating RPC, the screen shows, there is new version of npm available, lets update the npm using the command

```
npm -i -g npm
```

To view testrpc.sh file

```
cat testrpc.sh
```

To run testrpc.sh file

```
./testrpc.sh
```

Open new terminal & Run Explorer

```
cd explorer
```

```
npm start
```

Now, the Ethereum blocks tracker site <http://localhost:8000/> will show first block in the browser.

Image 2: Private Ethereum blockchain information

The image displays a terminal window on the left and a web browser on the right. The terminal shows the output of a web application running on localhost:8545, including GET requests for various assets and the JSON-RPC response for eth_getBlockByNumber.

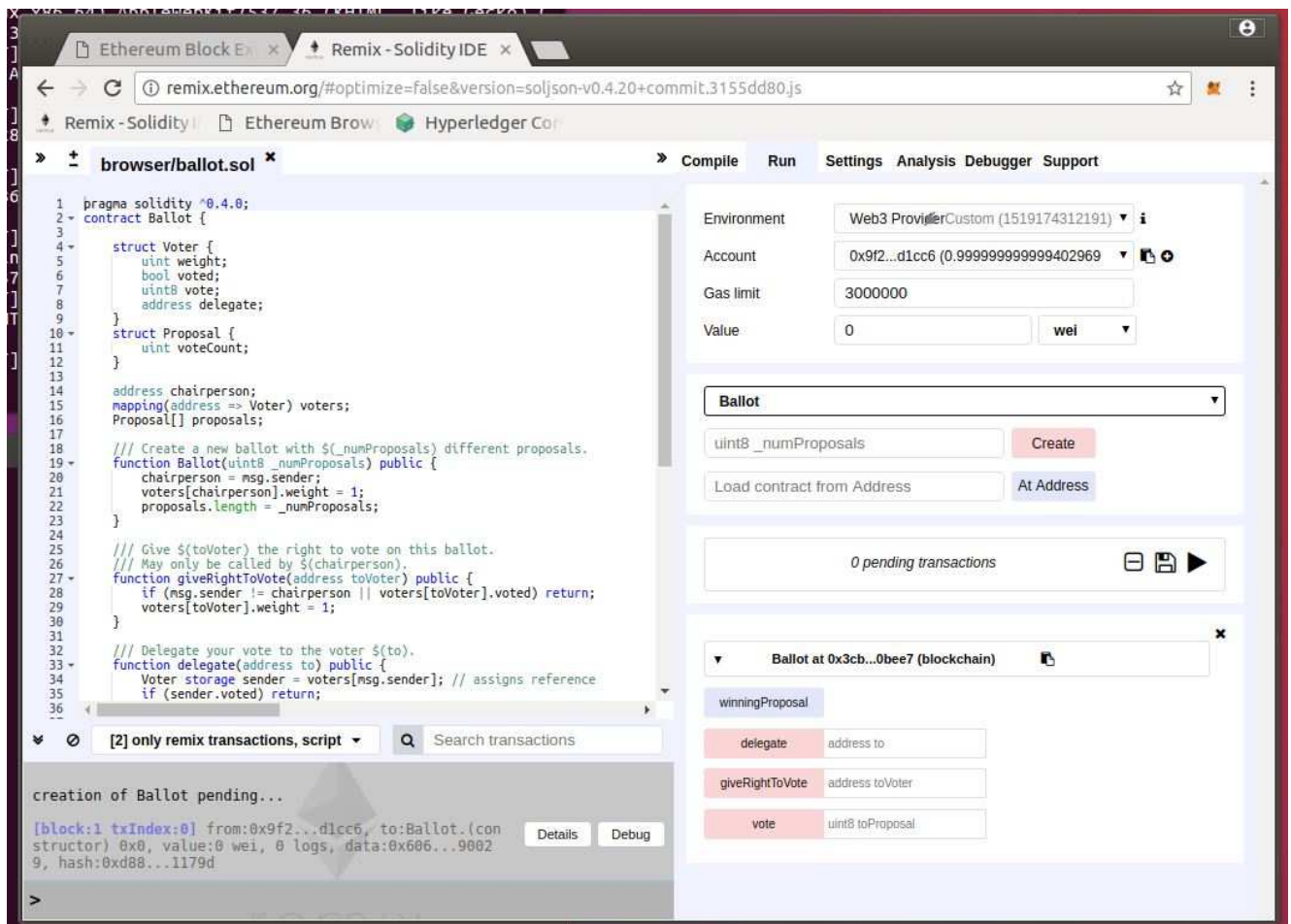
The web browser shows the Etherparty Block Explorer interface. It displays the 'Welcome to the Etherparty Block Explorer!' message and a table with the latest block information.

Block #	Tx #	Size	Timestamp
0	0	1000	1519174312

The footer of the web interface indicates '© Etherparty.io 2017 | Fork me on GitHub'.

Again, now solidity program can be compiled and run from the remix browser going on the website <https://remix.ethereum.org>

Image 3: Remix Programming using Web3 Provider



Installing Private Blockchain

Open new terminal and install Git first

```
sudo apt install git
```

Image 4: installing Git


```

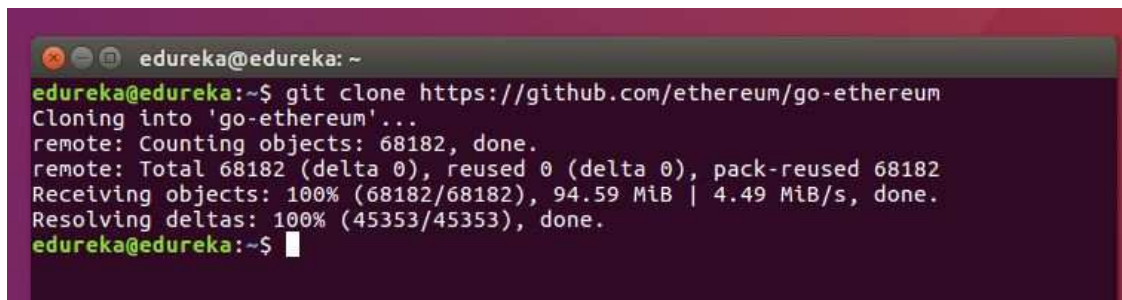
edureka@edureka: ~
edureka@edureka:~$ sudo apt install git
[sudo] password for edureka:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  gyp javascript-common libjs-inherits libjs-jquery libjs-node-uuid
  libjs-underscore libuv1 libuv1-dev linux-headers-4.10.0-28
  linux-headers-4.10.0-28-generic linux-headers-4.10.0-32
  linux-headers-4.10.0-32-generic linux-headers-4.10.0-35
  linux-headers-4.10.0-35-generic linux-headers-4.10.0-37
  linux-headers-4.10.0-37-generic linux-image-4.10.0-28-generic
  linux-image-4.10.0-32-generic linux-image-4.10.0-35-generic
  linux-image-4.10.0-37-generic linux-image-extra-4.10.0-28-generic
  linux-image-extra-4.10.0-32-generic linux-image-extra-4.10.0-35-generic
  linux-image-extra-4.10.0-37-generic node-abbrev node-ansi
  node-ansi-color-table node-archy node-async node-block-stream
  node-combined-stream node-cookie-jar node-delayed-stream node-forever-agent
  node-form-data node-fstream node-fstream-ignore node-github-url-from-git
  node-glob node-graceful-fs node-gyp node-inherits node-ini
  node-json-stringify-safe node-lockfile node-lru-cache node-mime
  node-minimatch node-mkdirp node-mute-stream node-node-uuid node-nopt
  node-normalize-package-data node-npmlog node-once node-osenv node-qs
  node-read node-read-package-json node-request node-retry node-rimraf
  node-semver node-sha node-sigmund node-slide node-tar node-tunnel-agent
  node-underscore node-which python-pkg-resources
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  git-man
Suggested packages:
  git-daemon-run | git-daemon-sysvinit git-doc git-el git-email git-gui gitk
  gitweb git-cvs git-mediawiki git-svn
The following packages will be upgraded:
  git git-man
2 upgraded, 0 newly installed, 0 to remove and 133 not upgraded.
Need to get 6,576 kB of archives.
After this operation, 1,058 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://ppa.launchpad.net/git-core/ppa/ubuntu xenial/main amd64 git amd64 1
:2.16.2-0ppa1~ubuntu16.04.1 [5,045 kB]
Get:2 http://ppa.launchpad.net/git-core/ppa/ubuntu xenial/main amd64 git-man all
1:2.16.2-0ppa1~ubuntu16.04.1 [1,531 kB]
Fetched 6,576 kB in 10s (605 kB/s)
(Reading database ... 354853 files and directories currently installed.)
Preparing to unpack .../git_1%3a2.16.2-0ppa1~ubuntu16.04.1_amd64.deb ...
Unpacking git (1:2.16.2-0ppa1~ubuntu16.04.1) over (1:2.15.0-1~ppa0~ubuntu16.04.1
) ...
Preparing to unpack .../git-man_1%3a2.16.2-0ppa1~ubuntu16.04.1_all.deb ...
Unpacking git-man (1:2.16.2-0ppa1~ubuntu16.04.1) over (1:2.15.0-1~ppa0~ubuntu16.
04.1) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up git-man (1:2.16.2-0ppa1~ubuntu16.04.1) ...
Setting up git (1:2.16.2-0ppa1~ubuntu16.04.1) ...#.....]
edureka@edureka:~$

```

Clone Go-Ethereum (Geth)

```
git clone https://github.com/ethereum/go-ethereum
```

Image 5: Cloning go-ethereum from github

A terminal window with a dark background and light green text. The prompt is 'edureka@edureka: ~'. The command 'git clone https://github.com/ethereum/go-ethereum' has been executed. The output shows the cloning progress: 'Cloning into 'go-ethereum'...', 'remote: Counting objects: 68182, done.', 'remote: Total 68182 (delta 0), reused 0 (delta 0), pack-reused 68182', 'Receiving objects: 100% (68182/68182), 94.59 MiB | 4.49 MiB/s, done.', and 'Resolving deltas: 100% (45353/45353), done.'. The prompt returns to 'edureka@edureka: ~\$' with a cursor.

```
edureka@edureka: ~$ git clone https://github.com/ethereum/go-ethereum
Cloning into 'go-ethereum'...
remote: Counting objects: 68182, done.
remote: Total 68182 (delta 0), reused 0 (delta 0), pack-reused 68182
Receiving objects: 100% (68182/68182), 94.59 MiB | 4.49 MiB/s, done.
Resolving deltas: 100% (45353/45353), done.
edureka@edureka: ~$
```

Now go inside go-ethereum folder

```
cd go-ethereum
```

Check the version of Geth

```
git tag
```

Image 6: geth Versions

A terminal window with a dark background and light green text. The output of the 'git tag' command is displayed as a list of version tags: v1.4.6, v1.4.7, v1.4.8, v1.4.9, v1.5.0, v1.5.1, v1.5.2, v1.5.3, v1.5.4, v1.5.5, v1.5.6, v1.5.7, v1.5.8, v1.5.9, v1.6.0, v1.6.1, v1.6.2, v1.6.3, v1.6.4, v1.6.5, v1.6.6, v1.6.7, and a colon ':'.

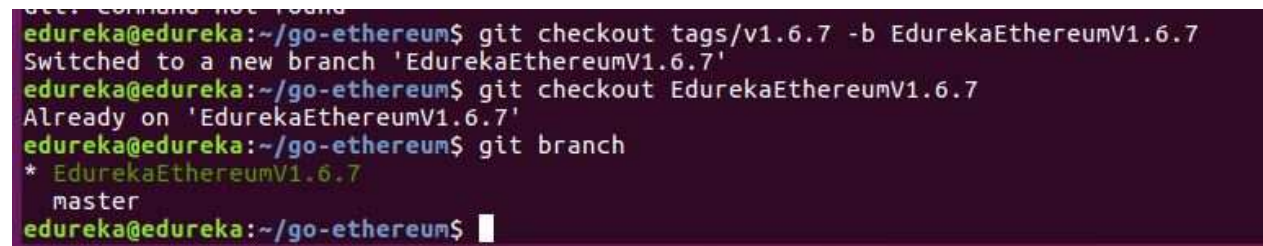
```
v1.4.6
v1.4.7
v1.4.8
v1.4.9
v1.5.0
v1.5.1
v1.5.2
v1.5.3
v1.5.4
v1.5.5
v1.5.6
v1.5.7
v1.5.8
v1.5.9
v1.6.0
v1.6.1
v1.6.2
v1.6.3
v1.6.4
v1.6.5
v1.6.6
v1.6.7
:
```

Create a new branch named called EdurekaEthereumV1.6.7 and switch to this branch using Geth version 1.6.7

```
git checkout tags/v1.6.7 -b EdurekaEthereumV1.6.7
```

```
git branch
```

Image 7: creating branch

A terminal window with a dark purple background and green text. The prompt is 'edureka@edureka:~/go-ethereum\$'. The first command is 'git checkout tags/v1.6.7 -b EdurekaEthereumV1.6.7', which results in 'Switched to a new branch 'EdurekaEthereumV1.6.7''. The second command is 'git checkout EdurekaEthereumV1.6.7', which results in 'Already on 'EdurekaEthereumV1.6.7''. The third command is 'git branch', which lists two branches: '* EdurekaEthereumV1.6.7' and 'master'. The prompt returns to 'edureka@edureka:~/go-ethereum\$'.

Go-Lang Installation

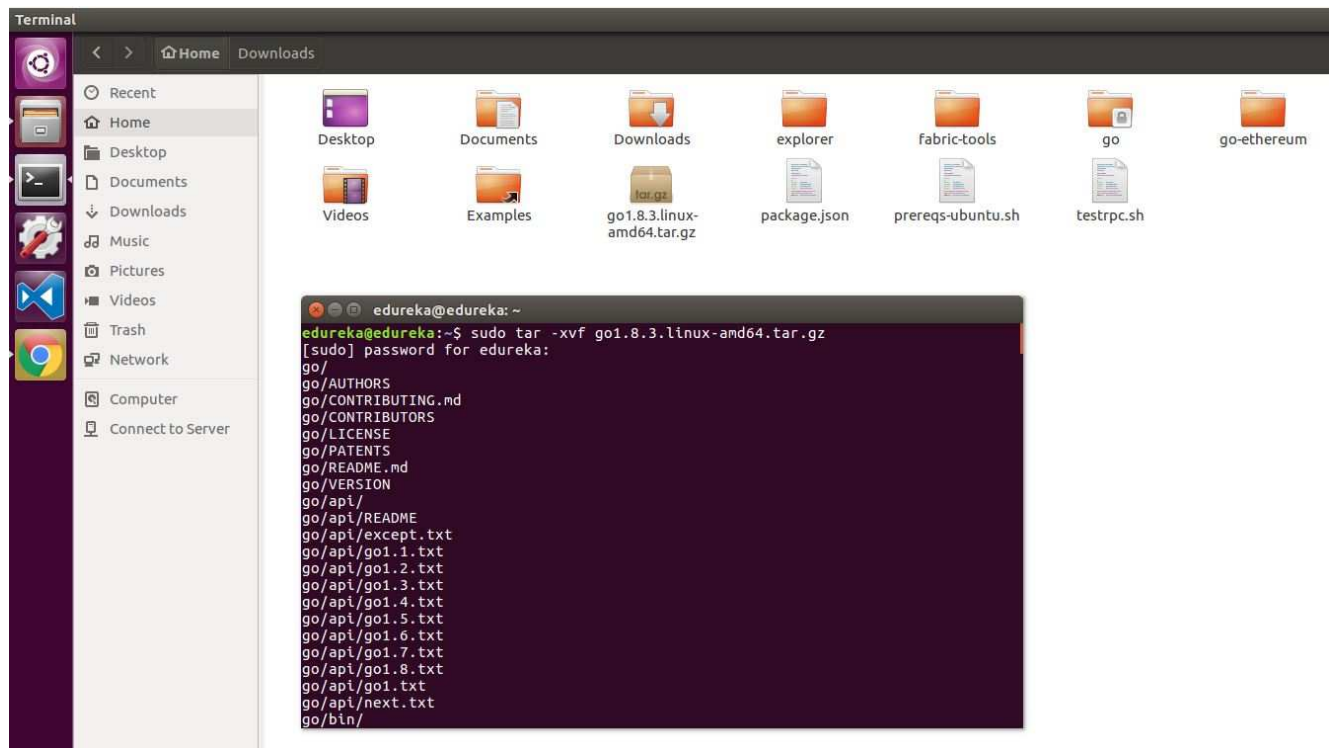
Go to the site <https://golang.org/dl/> and download [go1.8.3.linux-amd64.tar.gz](https://golang.org/dl/go1.8.3.linux-amd64.tar.gz)

Copy the downloaded file from downloads folder to home holder to run following command.

Extract the downloaded Go-Lang file

```
sudo tar -xvf go1.8.3.linux-amd64.tar.gz
```

Image 8: Install/extract Go-Lang



Move the extracted Go folder to /usr/local/

```
sudo mv go /usr/local
```

```
cd /usr/local
```

```
ls
```

Install GoLang

```
sudo apt install golang-go
```

Image 9: Installing GoLang


```

edureka@edureka: ~
edureka@edureka:~$ sudo apt install golang-go
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  gyp javascript-common libjs-inherits libjs-jquery libjs-node-uuid
  libjs-underscore libuv1 libuv1-dev linux-headers-4.10.0-28
  linux-headers-4.10.0-28-generic linux-headers-4.10.0-32
  linux-headers-4.10.0-32-generic linux-headers-4.10.0-35
  linux-headers-4.10.0-35-generic linux-headers-4.10.0-37
  linux-headers-4.10.0-37-generic linux-headers-4.10.0-38
  linux-headers-4.10.0-38-generic linux-image-4.10.0-28-generic
  linux-image-4.10.0-32-generic linux-image-4.10.0-35-generic
  linux-image-4.10.0-37-generic linux-image-4.10.0-38-generic
  linux-image-extra-4.10.0-28-generic linux-image-extra-4.10.0-32-generic
  linux-image-extra-4.10.0-35-generic linux-image-extra-4.10.0-37-generic
  linux-image-extra-4.10.0-38-generic node-abbrev node-ansi
  node-ansi-color-table node-archy node-async node-block-stream
  node-combined-stream node-cookie-jar node-delayed-stream node-forever-agent
  node-form-data node-fstream node-fstream-ignore node-github-url-from-git
  node-glob node-graceful-fs node-gyp node-inherits node-ini
  node-json-stringify-safe node-lockfile node-lru-cache node-mime
  node-minimatch node-mkdirp node-mute-stream node-node-uuid node-nopt
  node-normalize-package-data node-npmlog node-once node-osenv node-qs
  node-read node-read-package-json node-request node-retry node-rimraf
  node-semver node-sha node-sigmund node-slide node-tar node-tunnel-agent
  node-underscore node-which python-pkg-resources
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  golang-1.6-go golang-1.6-race-detector-runtime golang-1.6-src
  golang-race-detector-runtime golang-src
Suggested packages:
  bzr mercurial subversion
The following NEW packages will be installed:
  golang-1.6-go golang-1.6-race-detector-runtime golang-1.6-src golang-go
  golang-race-detector-runtime golang-src
0 upgraded, 6 newly installed, 0 to remove and 133 not upgraded.
Need to get 27.3 MB of archives.
After this operation, 198 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu xenial-updates/main amd64 golang-1.6-src amd64 1.6.2-0ubuntu5-16.04.4 [6,416 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu xenial-updates/main amd64 golang-1.6-go amd64 1.6.2-0ubuntu5-16.04.4 [20.5 MB]
Get:3 http://in.archive.ubuntu.com/ubuntu xenial/main amd64 golang-src amd64 2:1.6-1ubuntu4 [3,066 B]
Get:4 http://in.archive.ubuntu.com/ubuntu xenial/main amd64 golang-go amd64 2:1.6-1ubuntu4 [21.8 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu xenial/main amd64 golang-1.6-race-detector-runtime amd64 0.0+svn252922-0ubuntu1 [404 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu xenial/main amd64 golang-race-detector-runtime amd64 2:1.6-1ubuntu4 [2,854 B]
Fetched 27.3 MB in 15s (1,745 kB/s)
Selecting previously unselected package golang-1.6-src.
(Reading database ... 389820 files and directories currently installed.)
Preparing to unpack .../golang-1.6-src_1.6.2-0ubuntu5-16.04.4_amd64.deb ...
Unpacking golang-1.6-src (1.6.2-0ubuntu5-16.04.4) ...
Selecting previously unselected package golang-1.6-go.
Preparing to unpack .../golang-1.6-go_1.6.2-0ubuntu5-16.04.4_amd64.deb ...
Unpacking golang-1.6-go (1.6.2-0ubuntu5-16.04.4) ...
Selecting previously unselected package golang-src.
Preparing to unpack .../golang-src_2%3a1.6-1ubuntu4_amd64.deb ...
Unpacking golang-src (2:1.6-1ubuntu4) ...
Selecting previously unselected package golang-go.
Preparing to unpack .../golang-go_2%3a1.6-1ubuntu4_amd64.deb ...
Unpacking golang-go (2:1.6-1ubuntu4) ...
Selecting previously unselected package golang-1.6-race-detector-runtime.
Preparing to unpack .../golang-1.6-race-detector-runtime_0.0+svn252922-0ubuntu1_amd64.deb ...
Unpacking golang-1.6-race-detector-runtime (0.0+svn252922-0ubuntu1) ...
Selecting previously unselected package golang-race-detector-runtime.
Preparing to unpack .../golang-race-detector-runtime_2%3a1.6-1ubuntu4_amd64.deb ...
Unpacking golang-race-detector-runtime (2:1.6-1ubuntu4) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up golang-1.6-src (1.6.2-0ubuntu5-16.04.4) ...
Setting up golang-1.6-go (1.6.2-0ubuntu5-16.04.4) ...

```

Edit .bashrc file to add following environment variables

```
export GOROOT=/usr/local/go
```

```
export GOPATH=$HOME/Projects/Proj1
```

```
export PATH=$GOPATH/bin:$GOROOT/bin:$PATH
```

```
sudo gedit .bashrc
```


Image 10: .bashrc file

```

# sleep 10; alert
alias alert='notify-send --urgency=low -i "${[ $? = 0 ]} && echo terminal || echo error)"
"${history|tail -n1}sed -e \'\'s/^[0-9]\+\s*//;s/[]\s*alert$//\'\'"'

# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
    if [ -f /usr/share/bash-completion/bash_completion ]; then
        . /usr/share/bash-completion/bash_completion
    elif [ -f /etc/bash_completion ]; then
        . /etc/bash_completion
    fi
fi

export GOPATH=/usr/local/go
export GOPATH=$HOME/Projects/Proj1
export PATH=$GOPATH/bin:$GOROOT/bin:$PATH

export NVM_DIR="/home/edureka/.nvm"
[ -s "$NVM_DIR/nvm.sh" ] && . "$NVM_DIR/nvm.sh" # This loads nvm
[ -s "$NVM_DIR/bash_completion" ] && \. "$NVM_DIR/bash_completion" # This loads nvm
bash_completion

```

```
source .bashrc
```

```
go version
```

Image 11: Checking version go GoLang

```

Setting up golang-1.6-go (1.6.2-0ubuntu5~16.04.4) ...
Setting up golang-src (2:1.6-1ubuntu4) ...
Setting up golang-go (2:1.6-1ubuntu4) ...
Setting up golang-1.6-race-detector-runtime (0.0+svn252922-0ubuntu1) ...
Setting up golang-race-detector-runtime (2:1.6-1ubuntu4) ...
edureka@edureka:~$ clear

edureka@edureka:~$ source .bashrc
edureka@edureka:~$ go version
go version go1.8.3 linux/amd64
edureka@edureka:~$

```

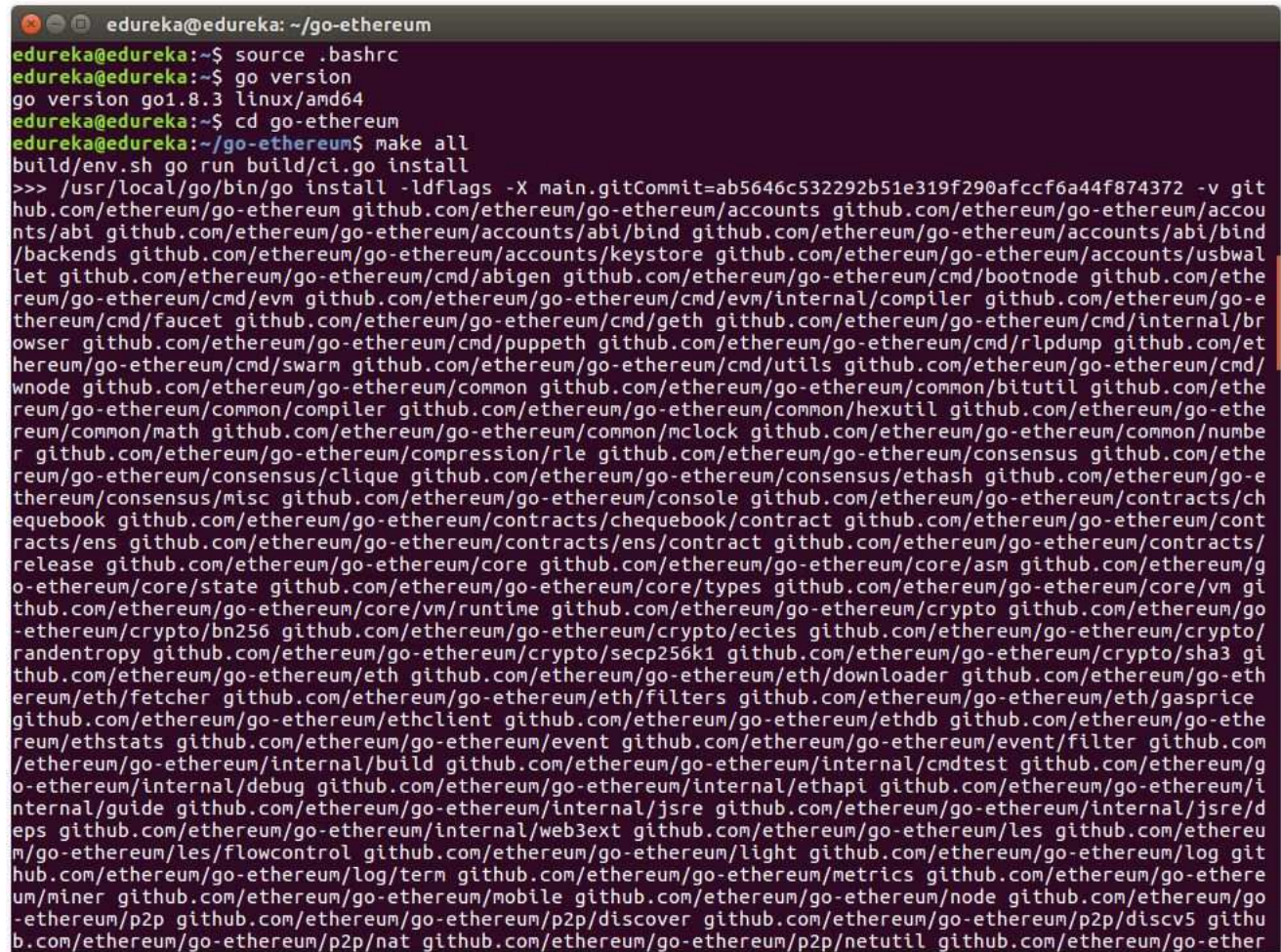
NOTE: if Go1 version is not displaying that means something wrong on environmental variable scripts on .bashrc file or some other steps are missing or unsupported versions got installed.

Run Make All Command

```
cd go-ethereum
```

```
make all
```

Image 12: make all command



```

edureka@edureka: ~/go-ethereum
edureka@edureka:~$ source .bashrc
edureka@edureka:~$ go version
go version go1.8.3 linux/amd64
edureka@edureka:~$ cd go-ethereum
edureka@edureka:~/go-ethereum$ make all
build/env.sh go run build/ci.go install
>>> /usr/local/go/bin/go install -ldflags -X main.gitCommit=ab5646c532292b51e319f290afccf6a44f874372 -v git
hub.com/ethereum/go-ethereum github.com/ethereum/go-ethereum/accounts github.com/ethereum/go-ethereum/accou
nts/abi github.com/ethereum/go-ethereum/accounts/abi/bind github.com/ethereum/go-ethereum/accounts/abi/bind
/backends github.com/ethereum/go-ethereum/accounts/keystore github.com/ethereum/go-ethereum/accounts/usbwal
let github.com/ethereum/go-ethereum/cmd/abigen github.com/ethereum/go-ethereum/cmd/bootnode github.com/ethe
reum/go-ethereum/cmd/evm github.com/ethereum/go-ethereum/cmd/evm/internal/compiler github.com/ethereum/go-e
thereum/cmd/faucet github.com/ethereum/go-ethereum/cmd/geth github.com/ethereum/go-ethereum/cmd/internal/br
owser github.com/ethereum/go-ethereum/cmd/puppeth github.com/ethereum/go-ethereum/cmd/rlpdump github.com/et
hereum/go-ethereum/cmd/swarm github.com/ethereum/go-ethereum/cmd/utlils github.com/ethereum/go-ethereum/cmd/
wnode github.com/ethereum/go-ethereum/common github.com/ethereum/go-ethereum/common/bitutil github.com/ethe
reum/go-ethereum/common/compiler github.com/ethereum/go-ethereum/common/hexutil github.com/ethereum/go-ethe
reum/common/math github.com/ethereum/go-ethereum/common/mclock github.com/ethereum/go-ethereum/common/numbe
r github.com/ethereum/go-ethereum/compression/rle github.com/ethereum/go-ethereum/consensus github.com/ethe
reum/go-ethereum/consensus/clique github.com/ethereum/go-ethereum/consensus/ethash github.com/ethereum/go-e
thereum/consensus/misc github.com/ethereum/go-ethereum/console github.com/ethereum/go-ethereum/contracts/ch
equebook github.com/ethereum/go-ethereum/contracts/chequebook/contract github.com/ethereum/go-ethereum/cont
racts/ens github.com/ethereum/go-ethereum/contracts/ens/contract github.com/ethereum/go-ethereum/contracts/
release github.com/ethereum/go-ethereum/core github.com/ethereum/go-ethereum/core/asm github.com/ethereum/g
o-ethereum/core/state github.com/ethereum/go-ethereum/core/types github.com/ethereum/go-ethereum/core/vm gi
thub.com/ethereum/go-ethereum/core/vm/runtime github.com/ethereum/go-ethereum/crypto github.com/ethereum/go
-ethereum/crypto/bn256 github.com/ethereum/go-ethereum/crypto/ecies github.com/ethereum/go-ethereum/crypto/
randentropy github.com/ethereum/go-ethereum/crypto/secp256k1 github.com/ethereum/go-ethereum/crypto/sha3 gi
thub.com/ethereum/go-ethereum/eth github.com/ethereum/go-ethereum/eth/downloader github.com/ethereum/go-eth
ereum/eth/fetcher github.com/ethereum/go-ethereum/eth/filters github.com/ethereum/go-ethereum/eth/gasprice
github.com/ethereum/go-ethereum/ethclient github.com/ethereum/go-ethereum/ethdb github.com/ethereum/go-ethe
reum/ethstats github.com/ethereum/go-ethereum/event github.com/ethereum/go-ethereum/event/filter github.com
/ethereum/go-ethereum/internal/build github.com/ethereum/go-ethereum/internal/cmdtest github.com/ethereum/g
o-ethereum/internal/debug github.com/ethereum/go-ethereum/internal/ethapi github.com/ethereum/go-ethereum/i
nternal/guide github.com/ethereum/go-ethereum/internal/jsre github.com/ethereum/go-ethereum/internal/jsre/d
eps github.com/ethereum/go-ethereum/internal/web3ext github.com/ethereum/go-ethereum/les github.com/ethereu
m/go-ethereum/les/flowcontrol github.com/ethereum/go-ethereum/light github.com/ethereum/go-ethereum/log git
hub.com/ethereum/go-ethereum/log/term github.com/ethereum/go-ethereum/metrics github.com/ethereum/go-ethere
um/miner github.com/ethereum/go-ethereum/mobile github.com/ethereum/go-ethereum/node github.com/ethereum/go
-ethereum/p2p github.com/ethereum/go-ethereum/p2p/discover github.com/ethereum/go-ethereum/p2p/discv5 githu
b.com/ethereum/go-ethereum/p2p/nat github.com/ethereum/go-ethereum/p2p/netutil github.com/ethereum/go-ether

```

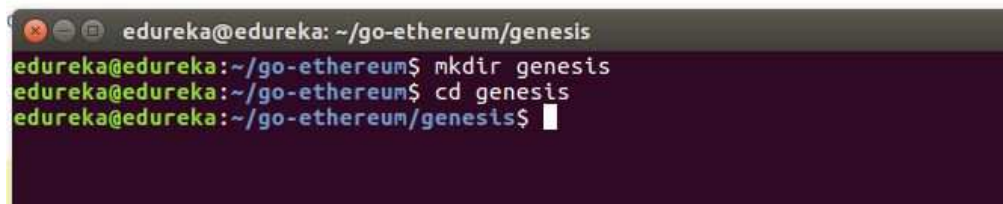
Extra Assignment: Creating Blockchain**Creating Genesis Block**

Create genesis folder under go-ethereum folder

```
mkdir genesis
```

```
cd genesis
```

Image 13: genesis folder



Add json script for genesis block with following script.

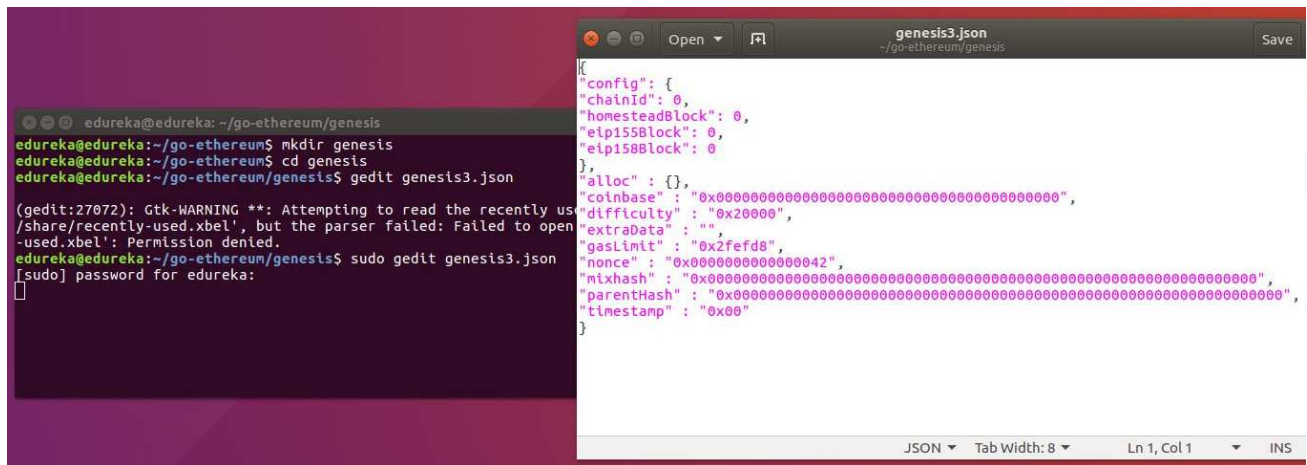
```
{  
  "config": {  
    "chainId": 0,  
    "homesteadBlock": 0,  
    "eip155Block": 0,  
    "eip158Block": 0  
  },  
  "alloc" : {},  
  "coinbase" : "0x000000000000000000000000000000000000",  
  "difficulty" : "0x20000",  
  "extraData" : "",  
  "gasLimit" : "0x2fefd8",  
  "nonce" : "0x0000000000000042",  
  "mixhash" : "0x0000000000000000000000000000000000000000000000000000000000000000",  
  "parentHash" : "0x0000000000000000000000000000000000000000000000000000000000000000",  
  "timestamp" : "0x00"
```



```
}
```

```
sudo gedit genesis3.json
```

Image 14: genesis block file



Starting Blockchain

Initialize blockchain

```
/home/edureka/go-ethereum/build/bin/geth --datadir ~/ethereum/net3 init
genesis/genesis3.json
```

Starting geth Console

```
/home/edureka/go-ethereum/build/bin/geth -datadir ~/ethereum/net3/ --
networkid 3 console
```