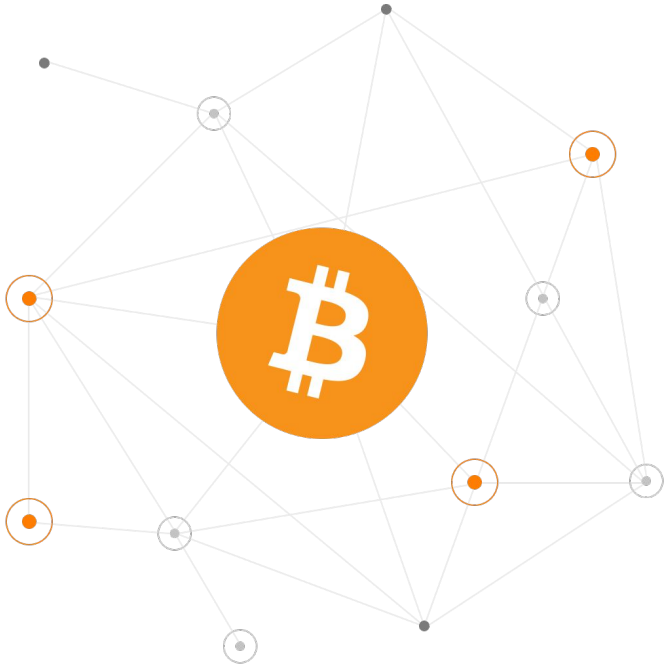

full node
:~$ bitcoin-cli -regtest
Bitcoin Core 101
v 23.0

Bitcoin

What this covers:

- Intro
- Free learning material
- Full Node (inc. setup script)
- Bitcoin Core commands



Intended audience:

A software developer taking first steps with Bitcoin Core or a pleb with an interest in code.

https://www.youtube.com/@python360

Bitcoin

If you want to get hands-on:

run bitcoin-core on your laptop!

You can use Python code to demonstrate concepts

```
pip install python-bitcoinlib
```

View blockchain

Install Bitcoin Core

try out bitcoin-cli -regtest

(+ Run a Full Node if you want to help the network)

https://www.youtube.com/@python360

Bitcoin

Isn’t it just funny money?

“Crypto” is a scam

I heard people lost money

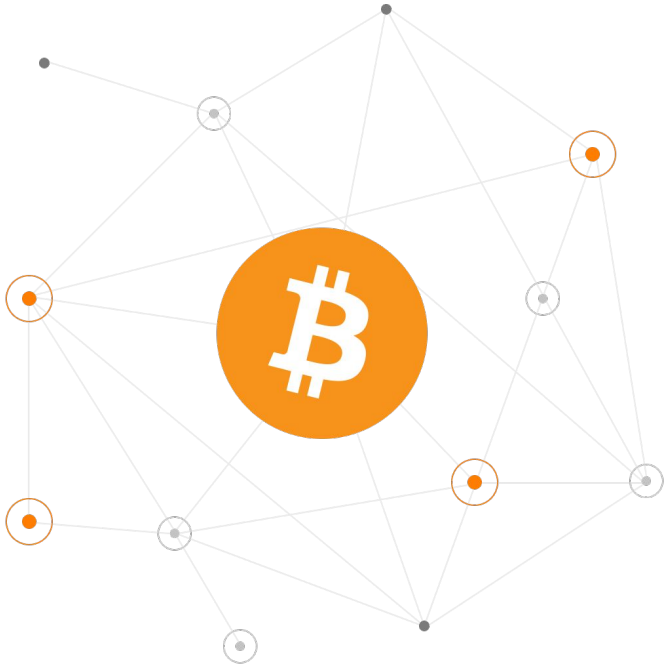
It’s too slow

It uses too much energy

I thought this was a ‘python channel’

https://en.bitcoin.it/wiki/Main_Page

Do you trust government and banks?



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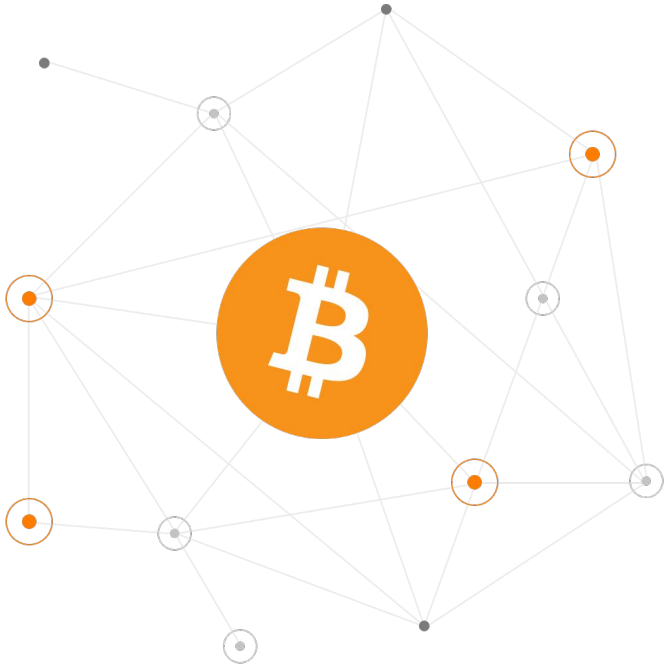
Bitcoin

Bitcoin encompasses more aspects of computer science than you would ever imagine.

Nothing you learn will be ‘redundant’

Think TCP/IP - it was niche and now...

TCP/IP was developed in the 1970s and adopted as the protocol standard for ARPANET (the predecessor to the Internet) in 1983.



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Bitcoin

BITNODES

Bitnodes estimates the relative size of the Bitcoin peer-to-peer network by finding all of its reachable nodes.

REACHABLE BITCOIN NODES

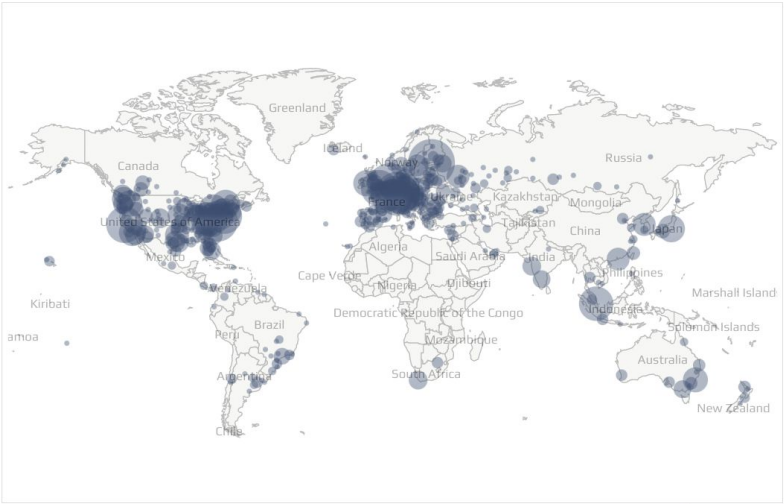
Updated: Sun Nov 20 09:07:14 2022 GMT

15137 NODES CHARTS

IPv4: -2.7% / IPv6: -1.0% / .onion: +11.0%

Top 10 countries with their respective number of reachable nodes are as follows.

RANK	COUNTRY	NODES
1	n/a	8426 (55.66%)
2	United States	1838 (12.14%)
3	Germany	1366 (9.02%)
4	France	429 (2.83%)
5	Netherlands	362 (2.39%)
6	Canada	291 (1.92%)
7	Finland	247 (1.63%)
8	United Kingdom	223 (1.47%)
9	Russian Federation	177 (1.17%)
10	Singapore	139 (0.92%)



Map shows concentration of reachable Bitcoin nodes found in countries around the world. LIVE MAP

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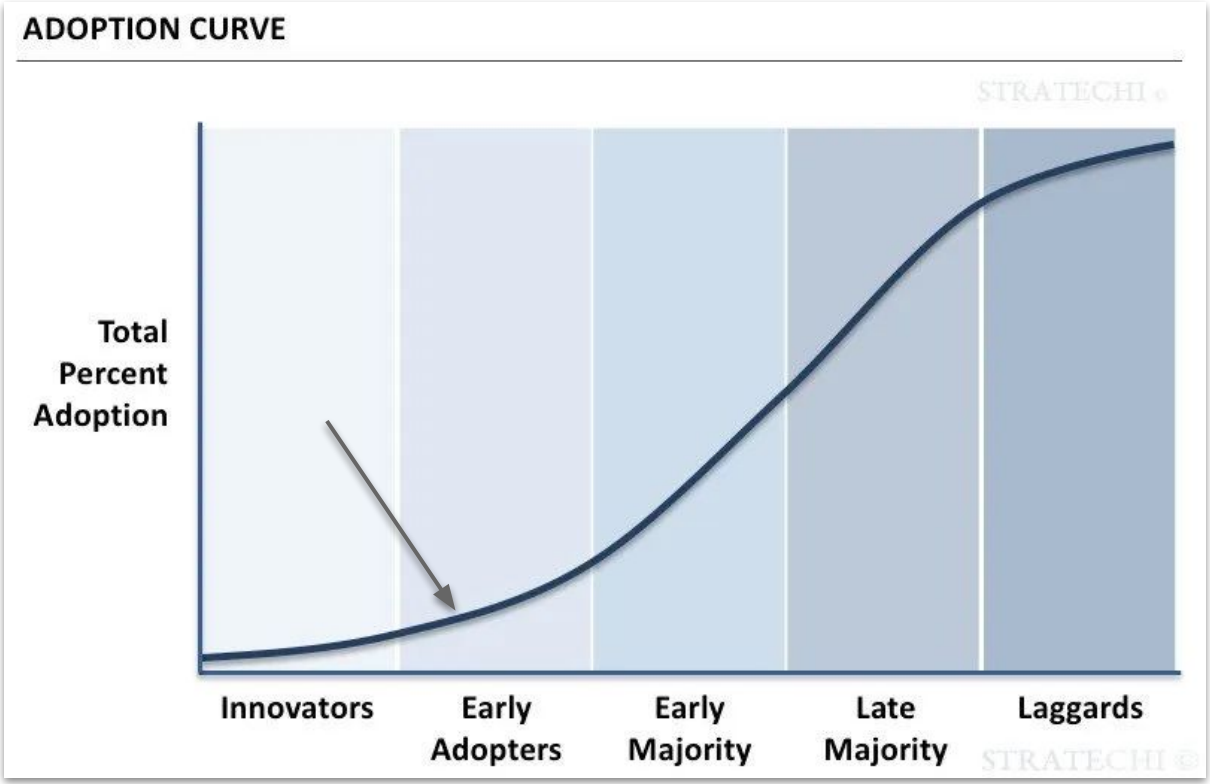
Bitcoin



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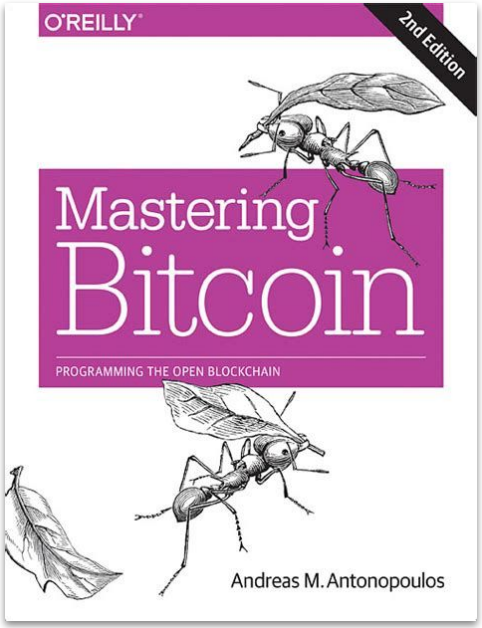
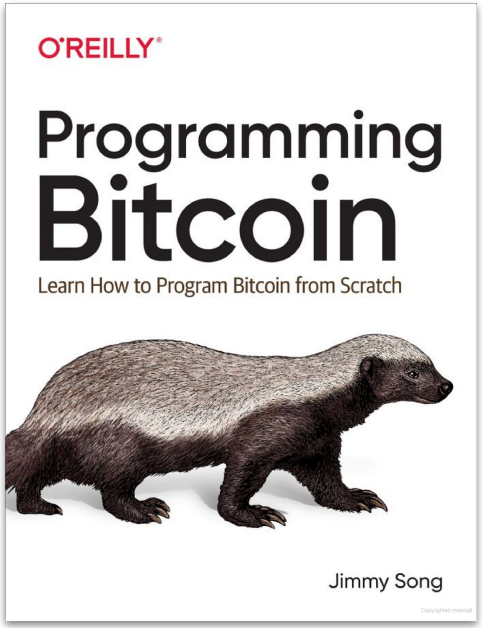
Bitcoin

how do I learn more?





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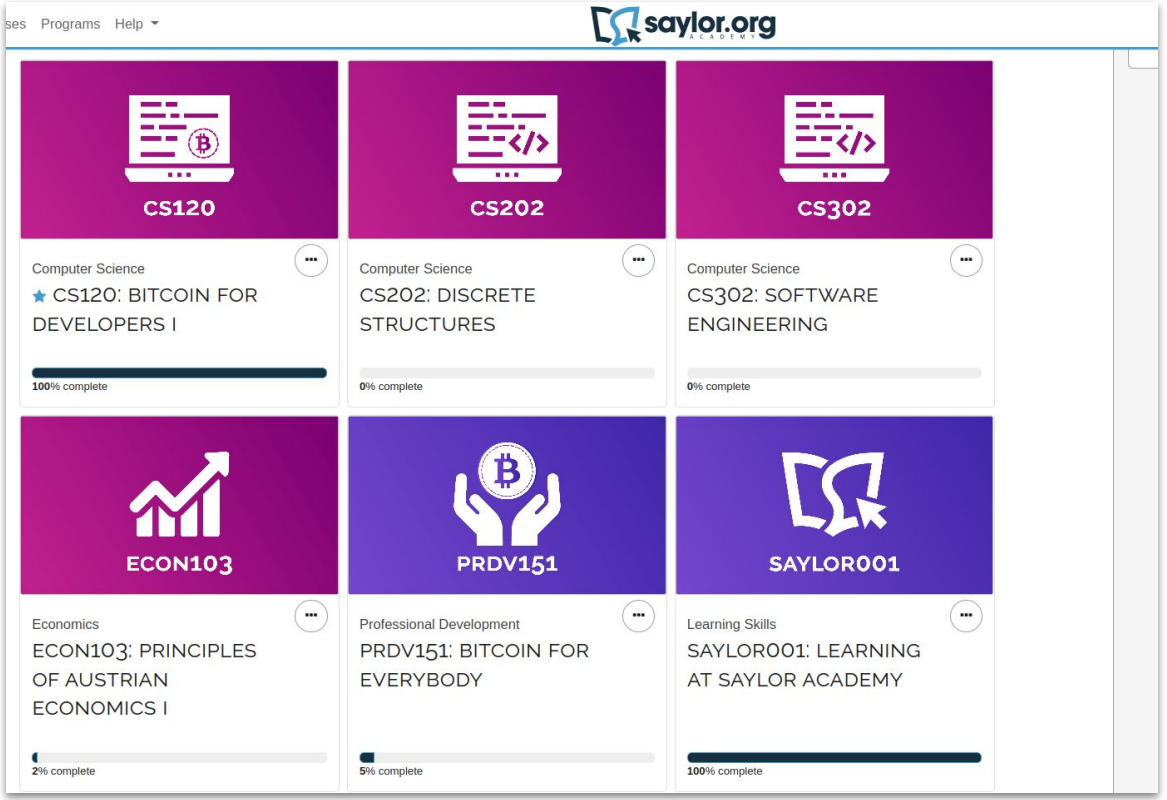
Bitcoin

Saylor.org



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Bitcoin

Overview:

All the “Money” (Satoshis) stays on the blockchain, it just gets reallocated to different owners.

The “Price” of Bitcoin is just a conversion rate from FIAT (legacy £,$)

Either using software on your phone or computer, or a “hardware wallet” you are able to “talk” to the blockchain and make transactions (“Buy”, “Sell”).

If you “Buy” or “Earn” some of the Bitcoin, it will be allocated to you, forever....(Until you spend it)

Bitcoin

Can I write code in Python?

Yes, although for commercial purposes you would probably use another language (compiled)

Bitcoin

```
$ pip install pybtc

import pybtc

a = pybtc.Address()

a.address

'bc1qgd8yzz8fv6aqvzu8xcj8fk5r3kc6qh3nzllmu5'
```

https://www.youtube.com/@python360

Bitcoin

```
IPython 7.13.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: import pybtc

In [2]: a = pybtc.Address()

In [3]: a.address
Out[3]: 'bc1qgd8yzz8fv6aqvzu8xcj8fk5r3kc6qh3nzllmu5'

In [4]: pybtc.is_address_valid('bc1qgd8yzz8fv6aqvzu8xcj8fk5r3kc6qh3nzllmu5')
Out[4]: True
```

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Bitcoin

You have just created an address that is more unique than a single atom in the observable universe!

What is it for?

That address can be linked to you (Using software OR a “Hardware Wallet”)

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Bitcoin

What is a full node, and why is it useful as a programmer?

It will allow you to write and test your own code to perform transactions on the blockchain, and understand the workings

Bitcoin

I know what a full node is, how can I start trying out some code?

Bitcoind – a daemon program that implements the Bitcoin protocol

```
> ./bitcoind --daemon
```

https://en.bitcoinwiki.org/wiki/Bitcoind

https://bitcoincore.org/

https://bitcoincore.org/en/download/

It is free to download.

You can use it to develop code, or run a ‘full node’

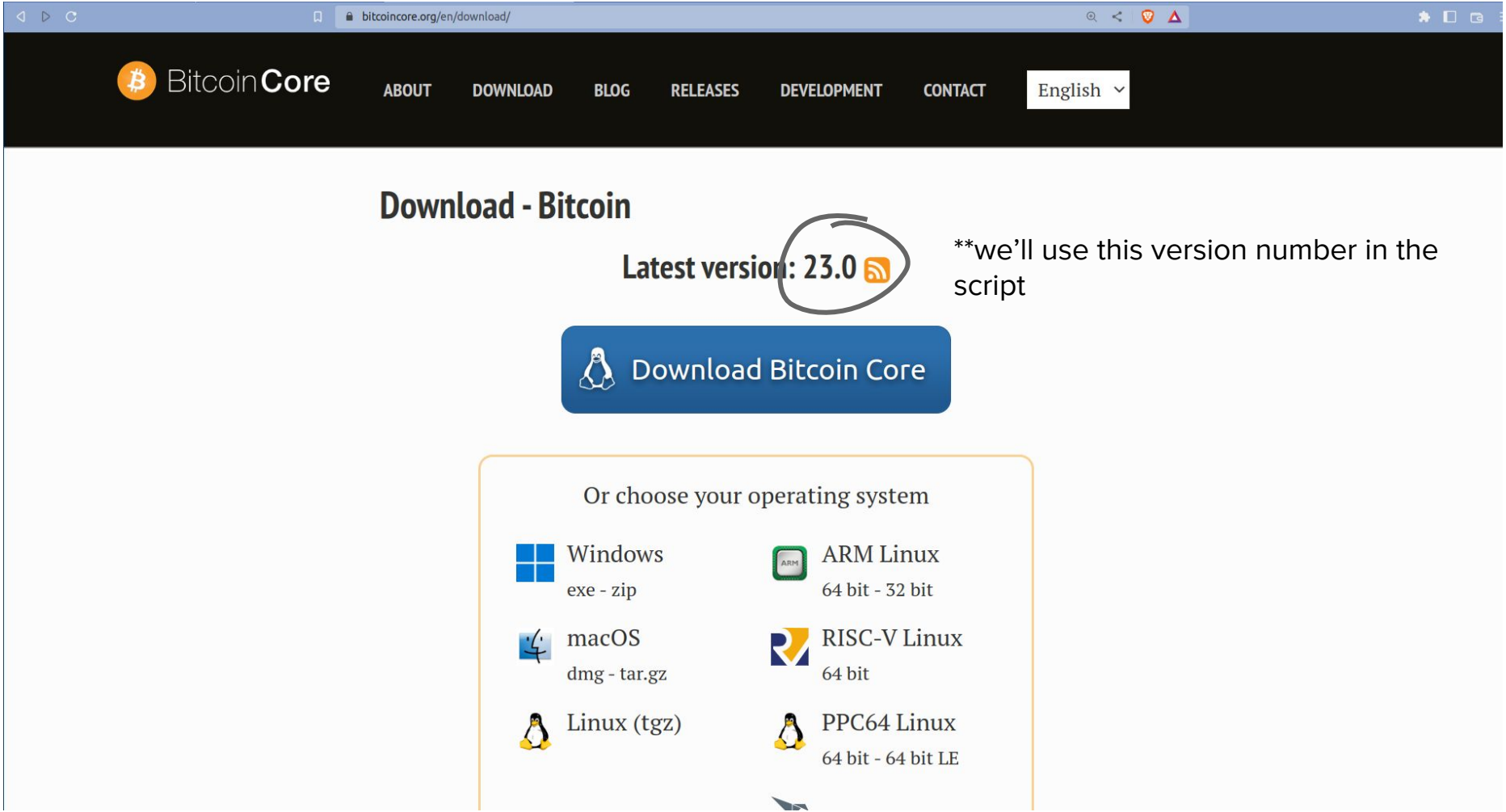

Bitcoin
‘Full Node’ Bitcoin Core

Bitcoin Core is an open source project which maintains and releases Bitcoin client software called “Bitcoin Core”.

It is a direct descendant of the original Bitcoin software client released by Satoshi Nakamoto after he published the famous Bitcoin whitepaper.

Bitcoin Core consists of both “full-node” software for fully validating the blockchain as well as a bitcoin wallet. The project also currently maintains related software such as the cryptography library libsecp256k1 and others located at GitHub.

https://bitcoincore.org/en/about/



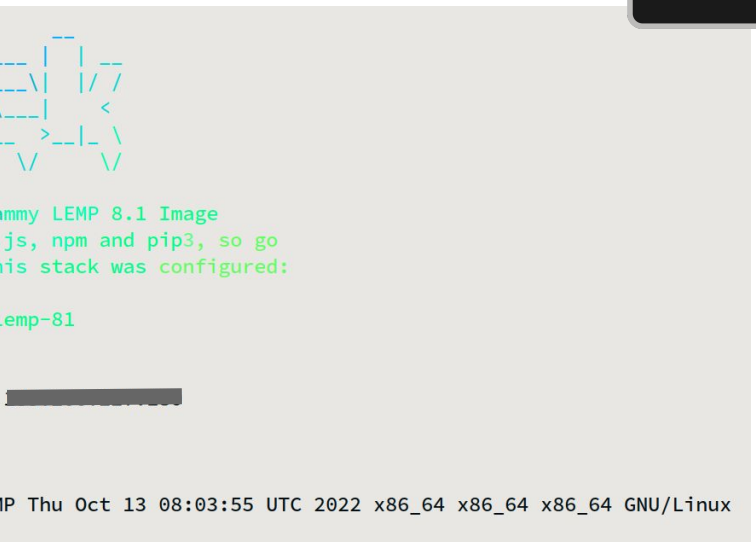
**we'll use this version number in the script

Bitcoin

How can I get this set up?

Run a script to do this on Mac, Linux, Raspberry Pi

I have regtest running on a Ubuntu VPS with Webdock



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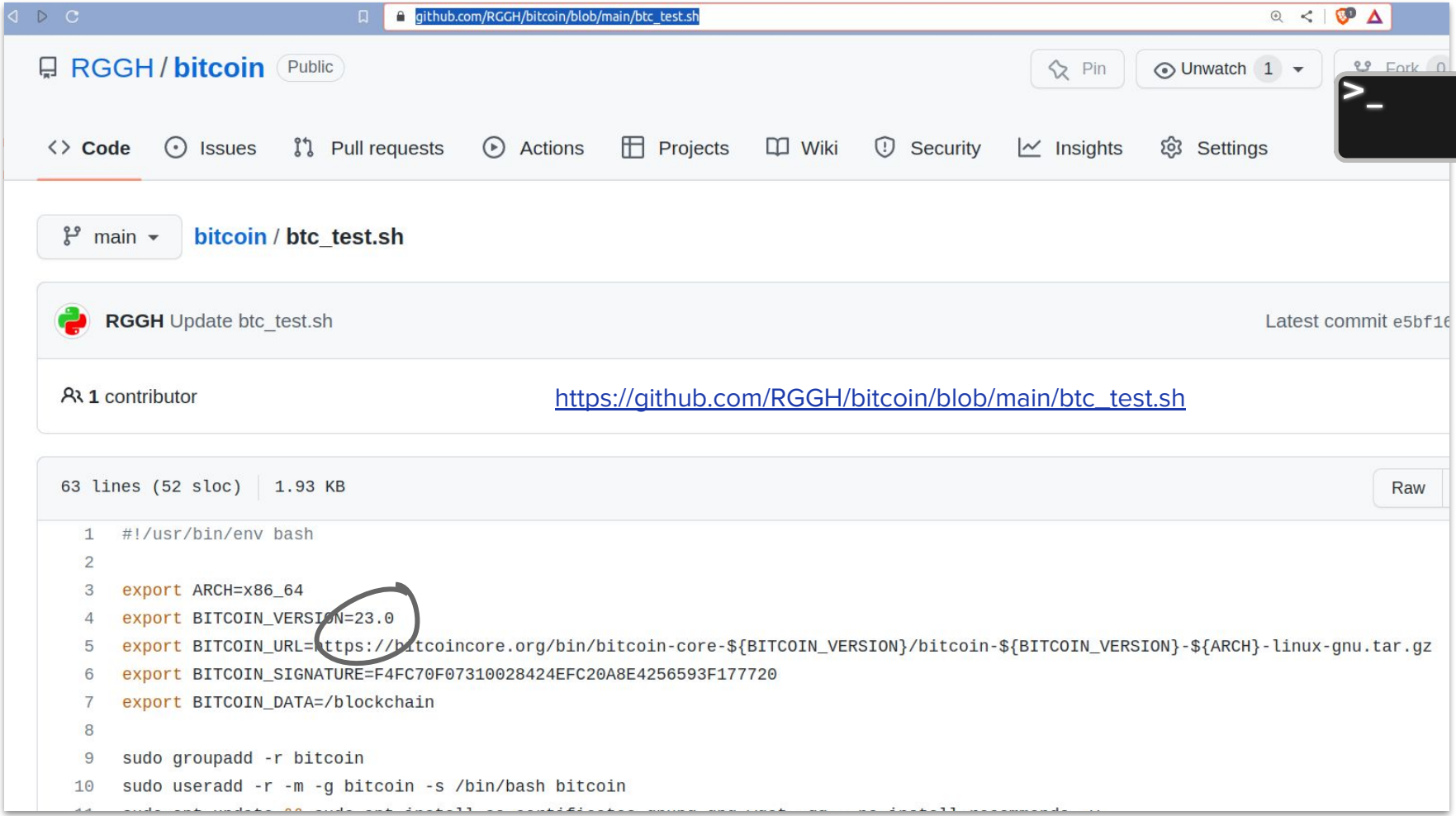
github.com/RGGH/bitcoin/blob/main/btc_test.sh
RGGH / bitcoin
Public
Pin
Unwatch 1
Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings
main
bitcoin / btc_test.sh
RGGH Update btc_test.sh
Latest commit e5bf16
1 contributor
https://github.com/RGGH/bitcoin/blob/main/btc_test.sh
63 lines (52 sloc) 1.93 KB
Raw
#!/usr/bin/env bash
export ARCH=x86_64
export BITCOIN_VERSION=23.0
export BITCOIN_URL=https://bitcoincore.org/bin/bitcoin-core-${BITCOIN_VERSION}/bitcoin-${BITCOIN_VERSION}-${ARCH}-linux-gnu.tar.gz
export BITCOIN_SIGNATURE=F4FC70F07310028424EFC20A8E4256593F177720
export BITCOIN_DATA=/blockchain
sudo groupadd -r bitcoin
sudo useradd -r -m -g bitcoin -s /bin/bash bitcoin

Bitcoin

Once the script has installed bitcoincore :

Bitcoind provides the RPC "interface" in which user can query with bitcoin-cli (or a library in c++).

You must run bitcoind before using bitcoin-cli

```
> ./bitcoind --daemon
```

Bitcoin

Interacting with “Bitcoin Core” :

The official implementation of the full node software…

If remotely installed on another computer: establish a **ssh** connection to the computer running “Bitcoin Core”

Bitcoin

Regtest

Regression test mode

A local testing environment in which developers can almost instantly generate blocks on demand for testing events, and can create private satoshis with no real-world value.

Not to be confused with: Testnet (a global testing environment which mostly mimics mainnet)

https://developer.bitcoin.org/glossary.html?highlight=regression

Bitcoin

```
admin@btcx:~$ bitcoin-cli -regtest -getinfo
Chain: regtest
Blocks: 1
Headers: 1
Verification progress: 100.0000%
Difficulty: 4.656542373906925e-10

Network: in 0, out 0, total 0
Version: 230000
Time offset (s): 0
Proxies: n/a
Min tx relay fee rate (BTC/kvB): 0.00001000

Balances
0.00000000 my_wallet
0.00000000 my_wallet_pk
0.00000000 moo
```

bitcoin-cli -regtest -getinfo

https://www.youtube.com/@python360

https://developer.bitcoin.org/reference/rpc/scantxoutset.html

Bitcoin

bitcoin-cli -regtest scantxoutset start '["raw(76a91411b366edfc0a8b66feebae5c2e25a7b6a5d1cf3188ac)#fm24fxxy"]'

```
admin@btcx:~$ bitcoin-cli -regtest scantxoutset start '["raw(76a91411b366edfc0a8b66feebae5c2e25a7b6a5d1cf3188ac)#fm24fxxy"]'
{
  "success": true,
  "txouts": 1,
  "height": 1,
  "bestblock": "38973495784add9f2519a8ae57fbc8b948e9630aeb7fa6a087698ff47b6188fa",
  "unspents": [
  ],
  "total_amount": 0.00000000
}
admin@btcx:~$ sc
```

“Scans the unspent transaction output set for entries that match certain output descriptors”

Bitcoin

$ bitcoin-cli -regtest createwallet moo
$ bitcoin-cli -regtest -rpcwallet=moo -generate

```
admin@btcx:~$ bitcoin-cli -regtest -generate
error code: -19
error message:
Wallet file not specified (must request wallet RPC through /wallet/<filename> uri-path).
Try adding "-rpcwallet=<filename>" option to bitcoin-cli command line.
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet=moo -generate
{
  "address": "bcrt1ql33rvtslkqn949kge9fxeuv0pca8pf0hm3c55t",
  "blocks": [
    "0036fac0a1ad350615427c19b184d18a1805603d92b397933333b83de67c50d7"
  ]
}
admin@btcx:~$
```

Bitcoin

$ bitcoin-cli -regtest -rpcwallet=moo -generate 2

```
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet=moo -generate 2
{
  "address": "bcrt1q4xaudr3k9034u7k2k9reeyh4h52gkk7k0u3fum",
  "blocks": [
    "50e29a67baa7a74664eb04d61529bf04cc7fb96dad2f114cb2aadfaac2ceaa44",
    "4f0dc778f3bbecfb1bf5f3374b7a11bc8db348f233df5662c4088383cdc5a131"
  ]
}
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet=moo getwalletinfo
{
  "walletname": "moo",
  "walletversion": 169900,
  "format": "sqlite",
  "balance": 0.00000000,
  "unconfirmed_balance": 0.00000000,
  "immature_balance": 200.00000000,
  "txcount": 4,
  "keypoolsize": 4000,
  "keypoolsize_hd_internal": 4000,
  "paytxfee": 0.00000000,
  "private_keys_enabled": true,
  "avoid_reuse": false,
  "scanning": false,
  "descriptors": true,
  "external_signer": false
}
admin@btcx:~$
```

$ bitcoin-cli -regtest -rpcwallet=moo getwalletinfo

```
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet=moo getwalletinfo
{
  "walletname": "moo",
  "walletversion": 169900,
  "format": "sqlite",
  "balance": 7850.00000000,
  "unconfirmed_balance": 0.00000000,
  "immature_balance": 2500.00000000,
  "txcount": 265,
  "keypoolsize": 4000,
  "keypoolsize_hd_internal": 4000,
  "paytxfee": 0.00000000,
  "private_keys_enabled": true,
  "avoid_reuse": false,
  "scanning": false,
  "descriptors": true,
  "external_signer": false
}
```

https://www.youtube.com/@python360

Bitcoin

$ bitcoin-cli -regtest -rpcwallet=moo -generate 2
$ bitcoin-cli -regtest -rpcwallet=moo getblockcount

```
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet=moo -generate 2
{
    "address": "bcrt1qxsz8wq4k5aw3hgwxm2yl8fuavmn7m4wm04u2ha",
    "blocks": [
    "7912147023ec2c18c2b2f9f02bd1bd5d31f0d20dd8e2adbcca2a1cc1aaa3f44f",
    "7647bfd05f9e68c3b3130a1fece231e977bc17e4737c3e0e50bf7f50f7c4572b"
    ]
}
admin@btcx:~$ bitcoin-cli -regtest getblockcount
6
```

https://www.youtube.com/@python360

Bitcoin

Examples:
> bitcoin-cli createrawtransaction "[{\"txid\":\"myid\",\"vout\":0}]" "[{\"address\":0.01}]"
> bitcoin-cli createrawtransaction "[{\"txid\":\"myid\",\"vout\":0}]" "[{\"data\":\"00010203\"}]"
> curl --user myusername --data-binary '{"jsonrpc": "1.0", "id": "curltest", "method": "createrawtransaction", "params": ["[{\"txid\":\"myid\",\"vout\":0}]", "[{\"address\":0.01}]"]}' -H 'content-type: text/plain;' http://127.0.0.1:8332/
> curl --user myusername --data-binary '{"jsonrpc": "1.0", "id": "curltest", "method": "createrawtransaction", "params": ["[{\"txid\":\"myid\",\"vout\":0}]", "[{\"data\":\"00010203\"}]"]}' -H 'content-type: text/plain;' http://127.0.0.1:8332/

Examples:
> bitcoin-cli createrawtransaction "[{\"txid\":\"myid\",\"vout\":0}]" "[{\"address\":0.01}]"
> bitcoin-cli createrawtransaction "[{\"txid\":\"myid\",\"vout\":0}]" "[{\"data\":\"00010203\"}]"
> curl --user myusername --data-binary '{"jsonrpc": "1.0", "id": "curltest", "method": "createrawtransaction",
0.01}]"]}' -H 'content-type: text/plain;' http://127.0.0.1:8332/
> curl --user myusername --data-binary '{"jsonrpc": "1.0", "id": "curltest", "method": "createrawtransaction",
0010203\"}]"]}' -H 'content-type: text/plain;' http://127.0.0.1:8332/

find a block's hash, then retrieve it

Bitcoin

$ bitcoin-cli -regtest getblockhash 1

$ bitcoin-cli -regtest getblock 38973495784add9f2519a8ae57fbc8b948e9630aeb7fa6a087698ff47b6188fa

```
admin@btcx:~$ bitcoin-cli -regtest getblockhash 1
38973495784add9f2519a8ae57fbc8b948e9630aeb7fa6a087698ff47b6188fa
admin@btcx:~$ bitcoin-cli -regtest getblock 38973495784add9f2519a8ae57fbc8b948e9630aeb7fa6a087698ff47b6188fa
{
  "hash": "38973495784add9f2519a8ae57fbc8b948e9630aeb7fa6a087698ff47b6188fa",
  "confirmations": 13,
  "height": 1,
  "version": 536870912,
  "versionHex": "20000000",
  "merkleroot": "5b12d4058c63e8003994640779340ead0acd7186fd9182a1b93f08788663b59e",
  "time": 1668723549,
  "mediantime": 1668723549,
  "nonce": 0,
  "bits": "207fffff",
  "difficulty": 4.656542373906925e-10,
  "chainwork": "0000000000000000000000000000000000000000000000000000000000000004",
  "nTx": 1,
  "previousblockhash": "0f9188f13cb7b2c71f2a335e3a4fc328bf5beb436012afca590b1a11466e2206",
  "nextblockhash": "0036fac0a1ad350615427c19b184d18a1805603d92b397933333b83de67c50d7",
  "strippedsize": 213,
  "size": 249,
  "weight": 888,
  "tx": [
    "5b12d4058c63e8003994640779340ead0acd7186fd9182a1b93f08788663b59e"
  ]
}
admin@btcx:~$
```

https://www.youtube.com/@python360

Bitcoin

find the tx and then you can look up the raw transaction next

```
admin@btcx:~$ bitcoin-cli -regtest getblock 38973495784add9f2519a8ae57fbc8b948e9630aeb7fa6a087698ff47b6188fa
{
  "hash": "38973495784add9f2519a8ae57fbc8b948e9630aeb7fa6a087698ff47b6188fa",
  "confirmations": 13,
  "height": 1,
  "version": 536870912,
  "versionHex": "20000000",
  "merkleroot": "5b12d4058c63e8003994640779340ead0acd7186fd9182a1b93f08788663b59e",
  "time": 1668723549,
  "mediantime": 1668723549,
  "nonce": 0,
  "bits": "207fffff",
  "difficulty": 4.656542373906925e-10,
  "chainwork": "0000000000000000000000000000000000000000000000000000000000000004",
  "nTx": 1,
  "previousblockhash": "0f9188f13cb7b2c71f2a335e3a4fc328bf5beb436012afca590b1a11466e2206",
  "nextblockhash": "0036fac0a1ad350615427c19b184d18a1805603d92b397933333b83de67c50d7",
  "strippedsize": 213,
  "size": 249,
  "weight": 888,
  "tx": [
    "5b12d4058c63e8003994640779340ead0acd7186fd9182a1b93f08788663b59e"
  ]
}
admin@btcx:~$
```

Bitcoin


```
admin@btcx:~$ bitcoin-cli -regtest getblockchaininfo
{
  "chain": "regtest",
  "blocks": 13,
  "headers": 13,
  "bestblockhash": "34cfa092f6988aead20f162f8a2d49dbc63520a4de38aed82051136badc13af6",
  "difficulty": 4.656542373906925e-10,
  "time": 1668776368,
  "mediantime": 1668776367,
  "verificationprogress": 1,
  "initialblockdownload": false,
  "chainwork": "000000000000000000000000000000000000000000000000000000000000001c",
  "size_on_disk": 4167,
  "pruned": false,
  "warnings": ""
}
```

https://developer.bitcoin.org/reference/rpc/generatetoaddress.html?highlight=generatetoaddress

Bitcoin

```
bitcoin-cli -regtest -rpcwallet=moo generatetoaddress 101 $(bitcoin-cli -regtest
-rpcwallet=moo getnewaddress)
```

```
[
  "097f3e9c6d0641534aff0a2421a84a07511b2df3d21ad80e6de3e2f38048a165",
  "74283b982a6829069b10b4c3b0261425278f7c675334728b2795925e758efceb",
  "0daa1e2b283b1831d3c3c69f4aee244a5fcd2cc6870e0d711f082db549b2767d",
  "52ca5ffc82907d10716a26c31eff8f752ac550a00677466db988f44ff277dbce",
  "7b4923aebe48c2eda850cdcc261c751b69b83b7034bef6e33ff3056763c80666",
....
...
..
```

Mine blocks immediately to a specified address

Bitcoin


```
bitcoin-cli -regtest -rpcwallet=moo listunspent
```


```
[
  {
    "txid": "814a2422666794e71e7d0aeff5b81a8aaccc815154e7b3e5e324f04bd8e45400",
    "vout": 0,
    "address": "bcrt1q7yl6prcjj4k62tw46sszrrpettmazj0kzspkt8",
    "label": "",
    "scriptPubKey": "0014f13fa08f12956da52dd5d420218c395af7d149f6",
    "amount": 50.00000000,
    "confirmations": 135,
    "spendable": true,
    "solvable": true,
    "desc": "wpkh([84bdebb1/84'/1'/0'/0/6]03d06b384cc175071c64999c79f08425600e6824b42932f47dfd01d8448eca334d)#n6fzfnl9",
    "safe": true
  },
  {
    "txid": "62f7bbcc7c3f6477530b2632b4f0af8ad04ff9fa3b0e33fe8a8e360873afe001",
    "vout": 0,
…
```

Bitcoin

admin@btcx:~$ bitcoin-cli -regtest -rpcwallet="moo" createrawtransaction '[{ "txid": "9c42a8167e88c5f566ae0a4d10e17fa70081691d14b91938aaf83df9cedf4d07", "vout": 1}]' '{"bcrt1qc2f4e3kq3xeunhk5csuguufgtka7hz8g9x40kp": 0.111, "bcrt1q8vculfa05wr6vhyh70nyw55jgd8aau2qxrl3nf": 49.888}'

*get your txid from a UTXO in your wallet

```
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet="moo" createrawtransaction '[{ "txid": "9c42a8167e88c5f566ae0a4d10e17fa70081691d14b91938aa
f83df9cedf4d07", "vout": 1}]' '{"bcrt1qc2f4e3kq3xeunhk5csuguufgtka7hz8g9x40kp": 0.111, "bcrt1q8vculfa05wr6vhyh70nyw55jgd8aau2qxrl3nf": 4
9.888}'
0200000001074ddfcef93df8aa3819b9141d698100a77fe1104d0aae66f5c5887e16a8429c0100000000ffffffff02605fa9000000000160014c2935cc6c089b3c9ded4
c4388e71285dbbeb88e8000c5b290100000001600143b31cfa7afa387a65c97f3e6475292434fdef14000000000
admin@btcx:~$
```

https://learn.saylor.org/mod/page/view.php?id=36361&forceview=1

Bitcoin

bitcoin-cli -regtest -rpcwallet="moo" signrawtransactionwithwallet
0200000001074ddfcef93df8aa3819b9141d698100a77fe1104d0aae66f5c5887e16a8429c0100000000ffffffff02605fa90000000000160014c2
935cc6c089b3c9ded4c4388e71285dbbeb88e8000c5b29010000001600143b31cfa7afa387a65c97f3e6475292434fdef14000000000

```
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet="moo" signrawtransactionwithwallet 0200000001074ddfcef93df8aa3819b9141d698100a77fe1104d0aa
e66f5c5887e16a8429c0100000000ffffffff02605fa90000000000160014c2935cc6c089b3c9ded4c4388e71285dbbeb88e8000c5b29010000001600143b31cfa7afa38
7a65c97f3e6475292434fdef14000000000
{
  "hex": "0200000001074ddfcef93df8aa3819b9141d698100a77fe1104d0aae66f5c5887e16a8429c0100000000ffffffff02605fa90000000000160014c2935cc6c0
89b3c9ded4c4388e71285dbbeb88e8000c5b29010000001600143b31cfa7afa387a65c97f3e6475292434fdef14000000000",
  "complete": false,
  "errors": [
    {
      "txid": "9c42a8167e88c5f566ae0a4d10e17fa70081691d14b91938aaf83df9cedf4d07",
      "vout": 1,
      "witness": [
      ],
      "scriptSig": "",
      "sequence": 4294967295,
      "error": "Input not found or already spent"
    }
  ]
}
admin@btcx:~$
```

https://developer.bitcoin.org/examples/testing.html

https://developer.bitcoin.org/examples/transactions.html

Bitcoin

```
$ bitcoin-cli -regtest -rpcwallet=moo getbalance

 3200.00000000

bitcoin-cli -regtest -rpcwallet="testx" getnewaddress
bcrt1qc2f4e3kq3xeunhk5csuguufgtka7hz8g9x40kp
```

```
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet=moo getunconfirmedbalance
0.00000000
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet=moo getbalance
7850.00000000
```

Bitcoin

```
admin@btcx:~$ bitcoin-cli -regtest -rpcwallet="testx" getnewaddress
bcrt1qc2f4e3kq3xeunhk5csuguufgtka7hz8g9x40kp
```

```
admin@btcx:~$ bitcoin-cli -regtest validateaddress bcrt1qc2f4e3kq3xeunhk5csuguufgtka7hz8g9x40kp
{
  "isvalid": true,
  "address": "bcrt1qc2f4e3kq3xeunhk5csuguufgtka7hz8g9x40kp",
  "scriptPubKey": "0014c2935cc6c089b3c9ded4c4388e71285dbbeb88e8",
  "isscript": false,
  "iswitness": true,
  "witness_version": 0,
  "witness_program": "c2935cc6c089b3c9ded4c4388e71285dbbeb88e8"
}
admin@btcx:~$
```

Bitcoin

General Info

getblockchaininfo
getmininginfo
getpeerinfo

Block Info

getblockcount
getbestblockhash
getblock hash
getblockhash index

Transaction Info

getrawmempool
getrawtransaction txid
decoderawtransaction rawtx

https://www.youtube.com/@python360

Bitcoin

```
admin@btcx:~/.bitcoin$ tree
.
├── regtest
│   ├── banlist.json
│   ├── bitcoind.pid
│   ├── blocks
│   │   ├── blk00000.dat
│   │   ├── index
│   │   │   ├── 000003.log
│   │   │   ├── CURRENT
│   │   │   ├── LOCK
│   │   │   └── MANIFEST-000002
│   │   └── rev00000.dat
│   ├── chainstate
│   │   ├── 000003.log
│   │   ├── CURRENT
│   │   ├── LOCK
│   │   └── MANIFEST-000002
│   ├── debug.log
│   ├── peers.dat
│   ├── settings.json
│   └── wallets
│       ├── moo
│       │   ├── wallet.dat
│       │   └── wallet.dat-journal
│       ├── my_wallet
│       │   ├── wallet.dat
│       │   └── wallet.dat-journal
│       └── my_wallet_pk
│           ├── wallet.dat
│           └── wallet.dat-journal
└── wallets
```

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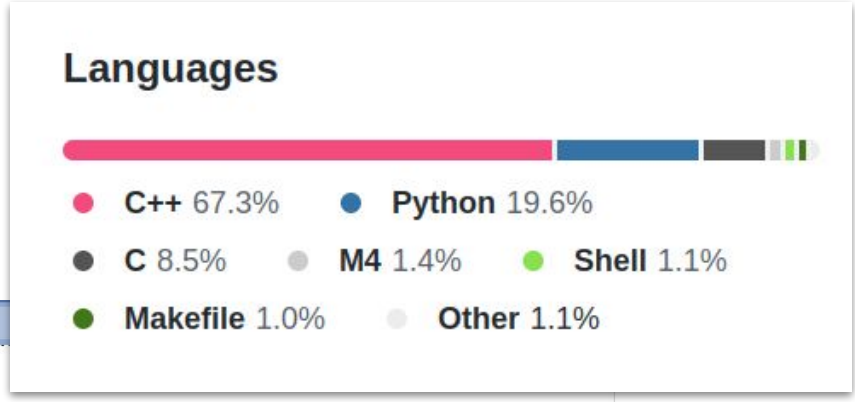
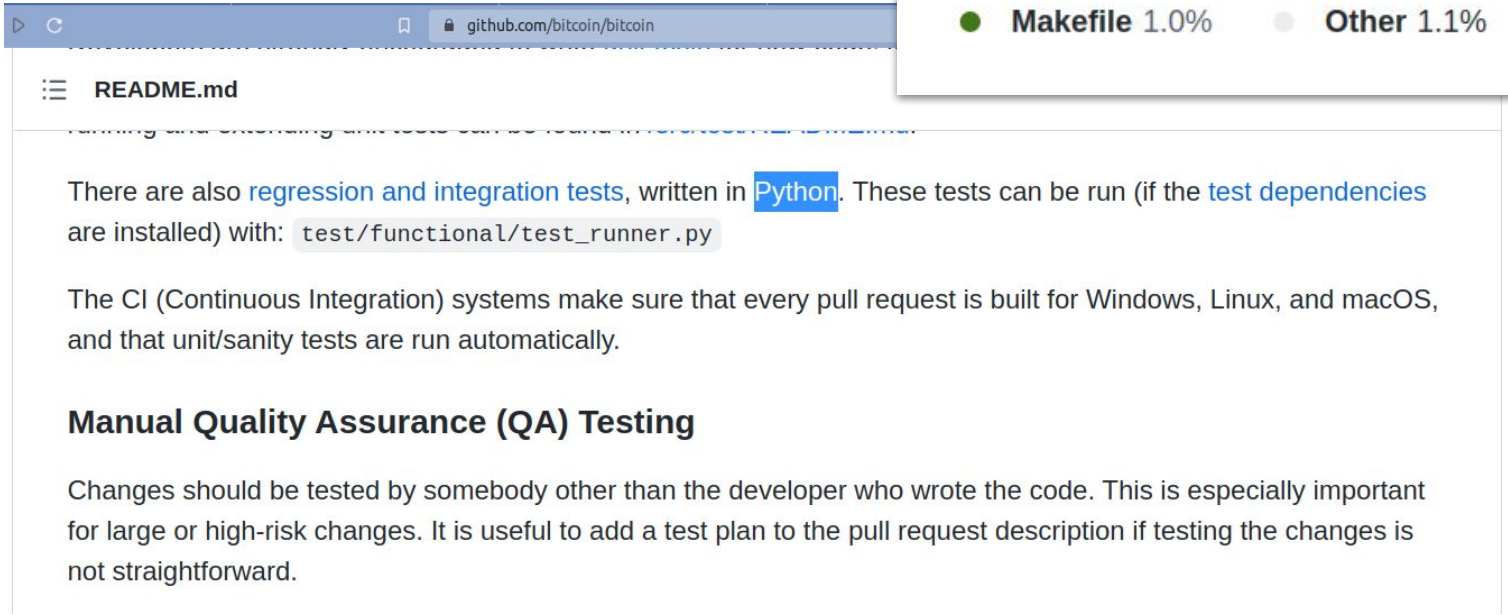
Bitcoin


```
admin@btcx:~/.bitcoin/regtest/wallets/my_wallet$ tree
.
├── wallet.dat
└── wallet.dat-journal
```

To be on the safe side, core wallet clients store their private keys in the wallet.dat file, acting as a master private key. The wallet.dat files hold your private keys, addresses, and transaction data. When these private keys or wallet.dat files are lost, it’s impossible to recover your wallet and the funds in it.

Bitcoin





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Bitcoin

```
# Original block reward for miners was 50 BTC
start_block_reward = 50

""" 210000 is around every 4 years with
    approx 10 minute block interval """

reward_interval = 210000

def max_money():
    # 50 BTC = 50 0000 0000 Satoshis
    current_reward = 50 * 10**8
    total = 0
    while current_reward > 0:
        total += reward_interval * current_reward
        current_reward /= 2
        print(str(current_reward))
    return total

print (f"total sats ever mined: { max_money()}")
```

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```
9e-323
4.4e-323
2e-323
1e-323
5e-324
0.0
total sats ever mined: 2100000000000000.0
```

```
~/Videos/_BITCOIN
❯
```

```python
# Original block reward for miners was 50 BTC
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```

Bitcoin

not your keys, not your coins...

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Bitcoin

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