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2 Setting a Development Machine

3 Hands-on Smart Contracts



December 30, 2017

#### Ethereum

Ethereum is a decentralized platform that runs smart contracts: applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third party interference.

— https://ethereum.org





#### Key Milestones:

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- (2017) ETH goes from \$7 to more than \$700 (100x increase)

Check the nice infographic (Invezz, 2017).

Also, see the official Ethereum White Paper.



#### Store of value



Figure: ETH price (Coindesk, 2017)



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#### Decentralization

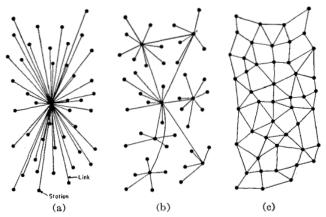


Fig. 1—(a) Centralized. (b) Decentralized. (c) Distributed networks.



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# Client Types

• Full node



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# Client Types

- Full node
- Light node





### Client Types

- Full node
- Light node
- Something in between (e.g. "fast" for geth)



#### Full Archive Ethereum node

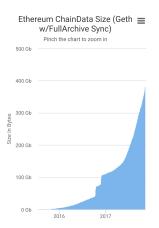


Figure: Miners need a lot of space (Reddit, 2017)



#### Ethereum vs. Bitcoin

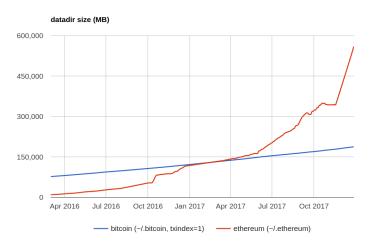


Figure: Disk space used by Geth (fast) vs. Bitcoin (Daniel, 2017)



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With Geth --syncmode fast (default mode)

This mode initializes a  $\sim$ 20 GB database, then turns in full node.

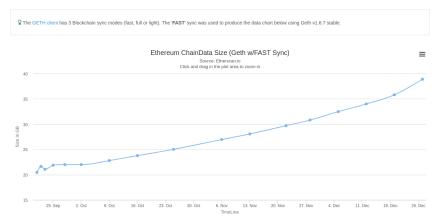


Figure: Disk space used by Geth (in fast mode) (Etherscan, 2017)



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Parity allows for continuous state trie pruning

In green, the configuration running as full node. A light client can fit in  ${\sim}5$  MB.

ID	Pruning Mode	Database Configuration	Block Verification	Available Blocks	Available States	Chaindata Size	Parity CLI Flags to use this configuration
(	Archive	+Fat +Trace	Full	All	All	385.000 GB	pruning archivetracing onfat-db on
- 1	Archive	+Trace	Full	All	All	334.000 GB	pruning archivetracing on
- 2	Archive		Full	All	All	326.000 GB	pruning archive
3	Fast	+Fat +Trace	Full	All	Recent	37.000 GB	tracing onfat-db on
4	Fast	+Trace	Full	All	Recent	34.000 GB	tracing on
	Fast		Full	All	Recent	26.000 GB	no-warp
(	Fast	+Warp	Ancient-PoW-Only	All	Recent	25.000 GB	
7	Fast	+Warp -Ancient	No-Ancient	Recent	Recent	5.300 GB	no-ancient-blocks
8	Light		Headers-Only	None	None	0.005 GB	light

Figure: Disk space used by Parity (Afri, 2017)



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# Assumptions & Recommendations

- 1) Ethereum Node, Wallet, Smart Contracts, and Dapps:
  - Linux machine (Ubuntu 16.04 / Linux Mint 18.x –until April 2021)
  - Parity (or Geth)
- 2) Quick setup, Portable, for Users and Developers on the go:
  - Chrome browser (or Chromium) -any OS
  - Metamask Extension
  - Remix IDE





# **Parity**



Figure: The Parity client syncing

- Typical Account Management, multi-sig, hardware support
- Access Dapps directly (e.g. app to create an ERC-20 token)
- Code editor and Solidity compiler for smart contracts
- Fast and reliable (written in Rust)
- Most OS, Docker images; and compliant with JSON-RPC API



#### Lab 1: set up a full Development Environment

# Installing Parity



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# Installing Parity



https://www.youtube.com/watch?v=WNT2O6xyDmM (Windows-based, 16 min)

- Go to https://www.parity.io
- 2 Download the relevant binaries, e.g. on Linux:
- Oheck the checksum: \$ md5sum parity\_1.7.11\_amd64.deb
- Install: \$ sudo dpkg -i parity\_1.7.11\_amd64.deb
- ⑤ Check the version: \$ parity -v



## Run Parity on the Kovan Testnet

Then go to http://localhost:8180 (or http://web3.site if online), and follow the instructions.

- After reading the legal terms and conditions, you can create your first account.
- Click on the top left-most logo (yellow bars) to see the status of your node.
- It may take 60+ minutes to sync!



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#### Try running your first Dapp

#### Follow the tutorial at

https://github.com/paritytech/parity/wiki/Tutorial-Part-1.

On Linux Ubuntu, make sure you have npm, and make a soft link to node before running init.sh:

```
$ sudo apt install npm
```

\$ ./init.sh



<sup>\$</sup> sudo ln -s /usr/bin/nodejs /usr/bin/node

Lab 1 (b): set up a full Development Environment

# Installing Geth





#### Installing Geth

#### Instructions (all OS) at

https://github.com/ethereum/go-ethereum/wiki/Building-Ethereum.

```
$ sudo apt-get install software-properties-common
$ sudo add-apt-repository -y ppa:ethereum/ethereum
$ sudo apt-get update
```

Run the first line to install the full suite (geth, bootnode, evm, disasm, rlpdump, ethtest), or the second line for geth only:

```
$ sudo apt-get install ethereum
$ sudo apt-get install geth
```



#### Installing a Solidity Compiler

Provided the previous steps were completed:

```
$ sudo apt-get install solc
$ which solc
```

And in geth, to let it know where solc can be found:

```
$ admin.setSolc("/usr/bin/solc")
```

Now test the code by following the instructions at <a href="https://github.com/ethereum/go-ethereum/wiki/Contract-Tutorial">https://github.com/ethereum/go-ethereum/wiki/Contract-Tutorial</a>



## And you still need a wallet

#### Options:

- Mist Browser (beta) (featured on the right, see also the recent security warning re. Chromium)
- MyEtherWallet (MEW) supports advanced features including hardware wallets



Mist Browser (beta) https://wallet.ethereum.org



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# Let's have some fun!





#### Install MetaMask

#### Follow step by step:

- Install the Chrome/Chromium extension
- Watch the intro on Youtube
- Create an account
- Switch to the Ropsten Testnet (top-left in MetaMask)
- Fill your account with Ether from https://faucet.metamask.io



https://metamask.io



# Create your own (ERC-20) token





- Use the Token Factory Dapp at https://tokenfactory.surge.sh/#/factory
- MetaMask will pop up (see picture above)
- Submit the transaction (on the Ropsten Testnet)
- **O** Check your transaction on https://ropsten.etherscan.io



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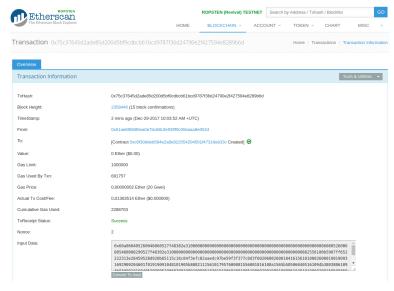
### Check your Smart Contract



- Select the "Sent" tab
- Check the orange Copy icon (Tx Hash)
- Click on "Contract Published"
- That should bring you to Etherscan (see next page)



# Verify the status of your transaction on Etherscan



Transaction Information: note the "To" line with your contract address

# Watch your Token





- Click on the "Add Token" button
- Wait for the next window (picture on the right)
- Oppy your contract address (from Etherscan)
- Go back to your Token Factory tab, which should show an UI to interact with your contract or go to the URL: https://tokenfactory.surge.sh/#/token/0x... (replace 0x... by your contract address)
- Move coins around
- In MetaMask, click on your token to check the tx on Etherscan



# Too easy?

Let's code it in Solidity like the pros!





# Coding your first ERC-20 Smart Contract



- **1** Open the Remix IDE at https://remix.ethereum.org
- Close the ballot file
- Oreate a new file named TokenRecipient.sol
- Oppy the code from https://ethereum.org/token (second white box, under "The Code", starting with "pragma")
- Switch to the "Run" tab (top-right bar, after Compile)

#### Reference:

ERC-20 Token Standard



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# Compiling Successfully



- Two green boxes should show on the right
- TokenERC20 is the name of the contract (class)
- tokenRecipient is the name of the interface
- Switch to the "Run" tab (top right)



# Submitting the Smart Contract



- Under the dropdown showing "TokenERC20", add a number (total amount of tokens to issue) and two strings (the latter is the token symbol)
- Add enough gas (top right, try 30)
- Olick Create and check whether MetaMask needs confirmation



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#### Interacting with the contract

 A new interface will pop up on the bottom right corner of the IDF





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# Thank you!

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#### References

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