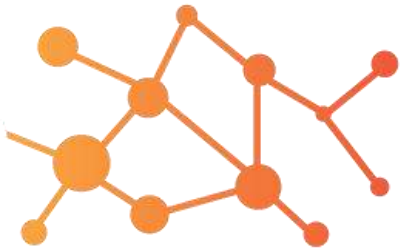

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Technology:Innovation:Business

1-day workshop on Smart Contracts

Madhu Parvathaneni
Director & Certified Blockchain Developer Expert
Madblocks Technologies Pvt Ltd
mad@madblocks.tech

For questions, write us on blockchain@madblocks.tech

Agenda

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Session – 1: Short Tour on the Blockchain

– Why is Blockchain?
– What is Blockchain?
– Tools Needed for this workshop
– Pre-Requisites

Session – 2: Creating your First Crypto Wallet

– Starting Ganache
– Configuring Metamask with Ganache
– Importing some accounts into metamask
– Making some transactions

Session – 3: Smart Contracts

– Smart Contracts
– Creating the first smart contract
– Deployment onto the Ganache
– Demonstration of some Dapps

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Session – 1: Short Tour on Blockchain

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Why we need a Blockchain?

- Our take on Blockchain

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Why the hell is this?

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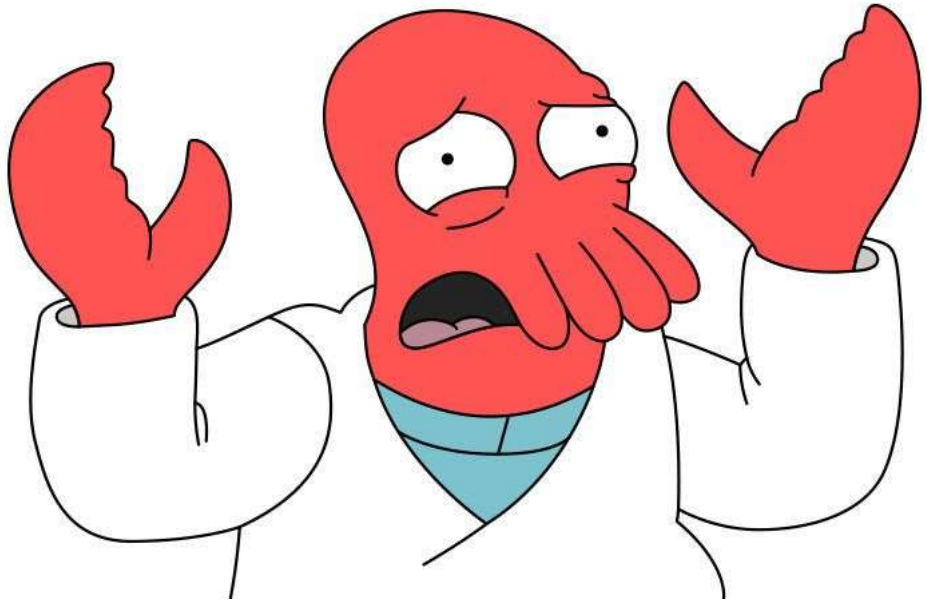
Top 2 quick scenarios

– Data Security

– Centralized Server



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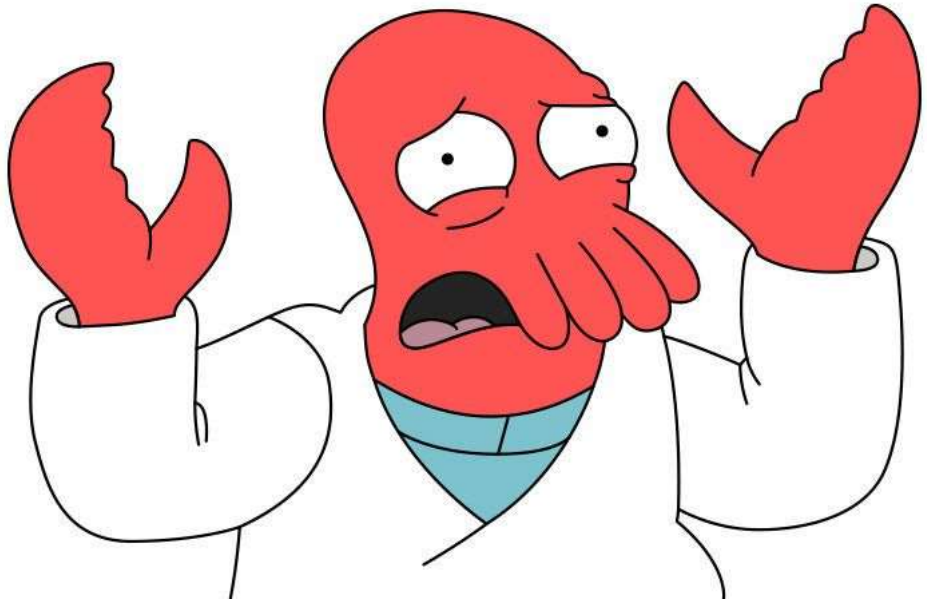

Data Security

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Is your data secured?

– Can you gurantee that your data stored in a third party server is secured enough?

For questions, write us on blockchain@madblocks.tech

Data Security

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Is your data secured?

– Can you gurantee that your data stored in a third party server is secured enough? **NO**

For questions, write us on blockchain@madblocks.tech

Data Security

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Is your data secured?

– Can you gurantee that your data stored in a third party server is secured enough? **NO**

– Do you have a control on your own data when it is openly available?

For questions, write us on blockchain@madblocks.tech

Data Security

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Data Security

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Is your data secured?

– Can you gurantee that your data stored in a third party server is secured enough? **NO**

– Do you have a control on your own data when it is openly available? **NO**

– Does your data have privacy in the internet world?

For questions, write us on blockchain@madblocks.tech

Data Security

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For questions, write us on blockchain@madblocks.tech

Data Security

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What you need?

– If your data is difficult to hack, then obviously you can say that your data is secured.

– If somone wants to access your data, you have to allow them with a token (cryptographic key) then it means that you have a control on your own data.

– Though data is open to public, they can view but they can’t understand what is that data all about. Hence, privacy is given.

#1. Blockchain gives this kind of security to your data.

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Why the hell is this?

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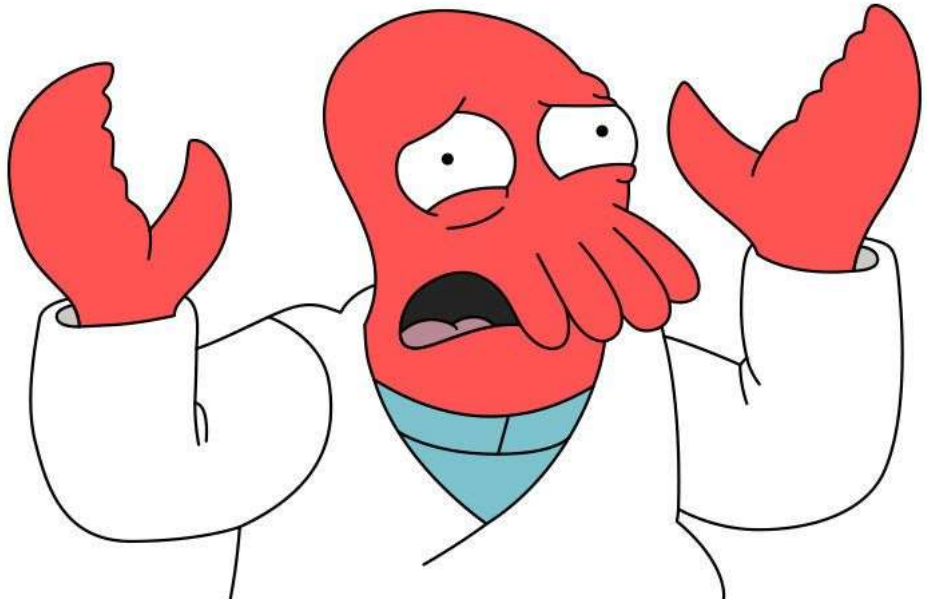
Top 2 quick scenarios

– Data Security

– Centralized Server



Centralized Server

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Is a centralized server a superman?

– If your server goes down, are you in a position to access your own data?

Centralized Server

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Is a centralized server a superman?

– If your server goes down, are you in a position to access your own data? **NO**

Centralized Server

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Is a centralized server a superman?

– If your server goes down, are you in a position to access your own data? **NO**

– Does someone is taking control on your data?

Centralized Server

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Is a centralized server a superman?

– If your server goes down, are you in a position to access your own data?

NO

– Does someone is taking control on your data?

YES

Centralized Server

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Is a centralized server a superman?

– If your server goes down, are you in a position to access your own data?

NO

– Does someone is taking control on your data?

YES

– Do you think that distributed computing itself will safeguard our data in a centralized system?

Centralized Server

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Is a centralized server a superman?

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NO

– Does someone is taking control on your data?

YES

– Do you think that distributed computing itself will safeguard our data in a centralized system?

NO

Centralized Server

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Centralized, Distributed, Decentralized

– Centralized systems directly control the operation of the individual units from a single center.

– Distributed means computation is spread across multiple nodes instead of just one.

– Decentralized means no node is instructing any other node as to what to do.

#2. Blockchains are Decentralized and Distrubuted across P2P Network

What Blockchain gives us?

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Key Benefits

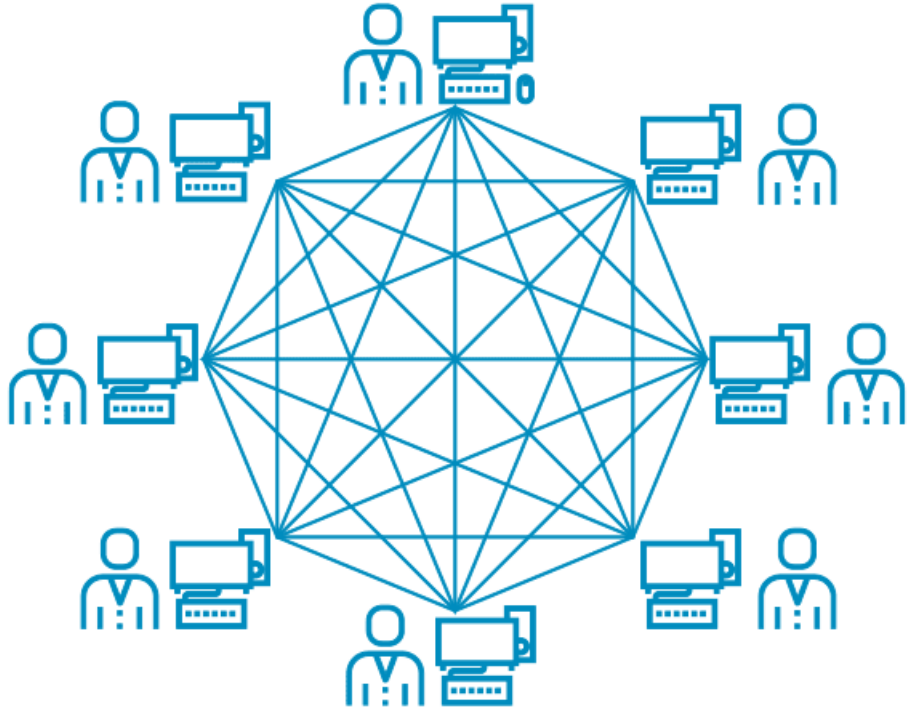
– Tamper-free

– More difficult to hack

– Decentralized and Distributed across P2P

– Trust

– Transparency



Summary

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Pack-Up!

– We gone through the key benefits of using Blockchain in our application development.

– Use Blockchain instead of general database server to store your data.

– Blockchain integrated with Cyber Security gives lot of scope in strengthening our data.

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What is Blockchain?

- Our take on Blockchain

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What is Blockchain ?

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Blockchain is the next avenger;

– Blockchain is a Distributed Ledger Technology (DLT) decentralized on a peer to peer network.

– Ledger is like a complete information about the blocks that gets appended on to the chain.

– Due to its transparency and tamper-free, blockchains are been using in different verticals.

– Blockchains are immutable, thereby the data that gets stored in it is one-time writtable.

Bitcoin

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Bitcoin

– Bitcoin is a digital currency, which is used and distributed electronically.

– It is a decentralized peer-to-peer network. No single bank institution or person controls it.

– Bitcoin is the first cryptocurrency which used Blockchain technology and hence, people started calling it as blockchain, but it is not;

– Bitcoin has the open-source public distributed ledger in p2p network called Blockchain

Ethereum

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Ethereum

– Ethereum is the second-largest cryptocurrency platform by market capitalization, behind Bitcoin.

– It is a decentralized open source Blockchain featuring smart contract functionality.

– Ether is the cryptocurrency generated by Ethereum miners as a reward for computations performed to secure the Blockchain

ethereum

Types of Blockchains

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Public Blockchain
In this type of Blockchain, ledgers are visible to everyone on the internet.
It allows anyone to verify and add a block of transactions to the Blockchain
Public networks have incentives for people to join and free for use.
Anyone can use a public blockchain network.

Private Blockchain
The private blockchain is within a single organization.
It allows only specific people of the organization to verify and add transaction blocks.
However, everyone on the internet is generally allowed to view.

Consortium Blockchain
In this Blockchain variant, only a group of organizations can verify and add transactions.
Here, the ledger can be open or restricted to select groups.
Consortium blockchain is used cross-organizations.
It is only controlled by pre-authorized nodes.

Basic Building Blocks of Blockchain

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1. P2P Network, Node/Peer
2. Miners
3. Hashing
4. Transactions
5. Block
6. Public and Private Keys (Digital Signature)
7. How Blockchain works?

P2P Network

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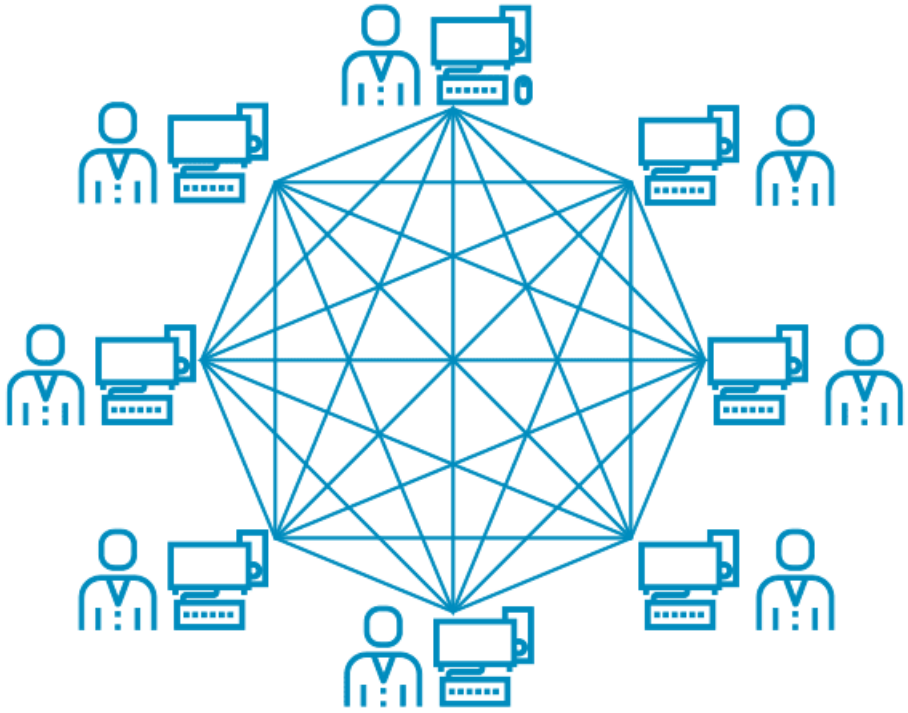
Decentralized and Distributed;

– Each node in the P2P network is called a peer who maintains the entire network.

– The person who maintains the network can able to mine the transaction.

– All the information would be duplicated across the P2P network, it means that all the peers will have same information.



Miners

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Someone who maintains the network;

– Each miner in the network maintains the entire full node (The nodes would be of type full and half nodes).

– Every miner will compete with other miners of the network to add a block to the blockchain.

– These miners will agree on a consensus algorithm to get the incentives and add block to the blockchain.

What is Hashing?

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What is Hashing?

– Hashing is a process of converting a data/piece of information to a Cryptographic value

– From the Cryptographic value, we can’t convert back to the text .i.e. it is one-way function

Text I/P: **Madblocks is rocking**
Hash: f384a135c4ac27a017139c29b0a84c2b408377cca74a81840fe92da5851d95cf

Text I/P: **Madblocks is rocking.**
Hash: 35628c955e794344927a4a1a8f289c49d9f3c5e0a911cc97636404d8677893c8

If you change input, then hash is going to be changed

What is transaction?

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What is transaction?

– Generally, the processing of a request alias purchase or sell which takes place in the digital world is called as transaction.

– In financial domain, the transactions will be holding some details like credit/debit that taken place between the entities.

– As per me, any kind of request that you make in the Blockchain Infrastructure is a transaction need not be only a money transaction but can be anything.

Digital Signature

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Signature created through Keys

– Private Key Cryptography

– Public Key Cryptography

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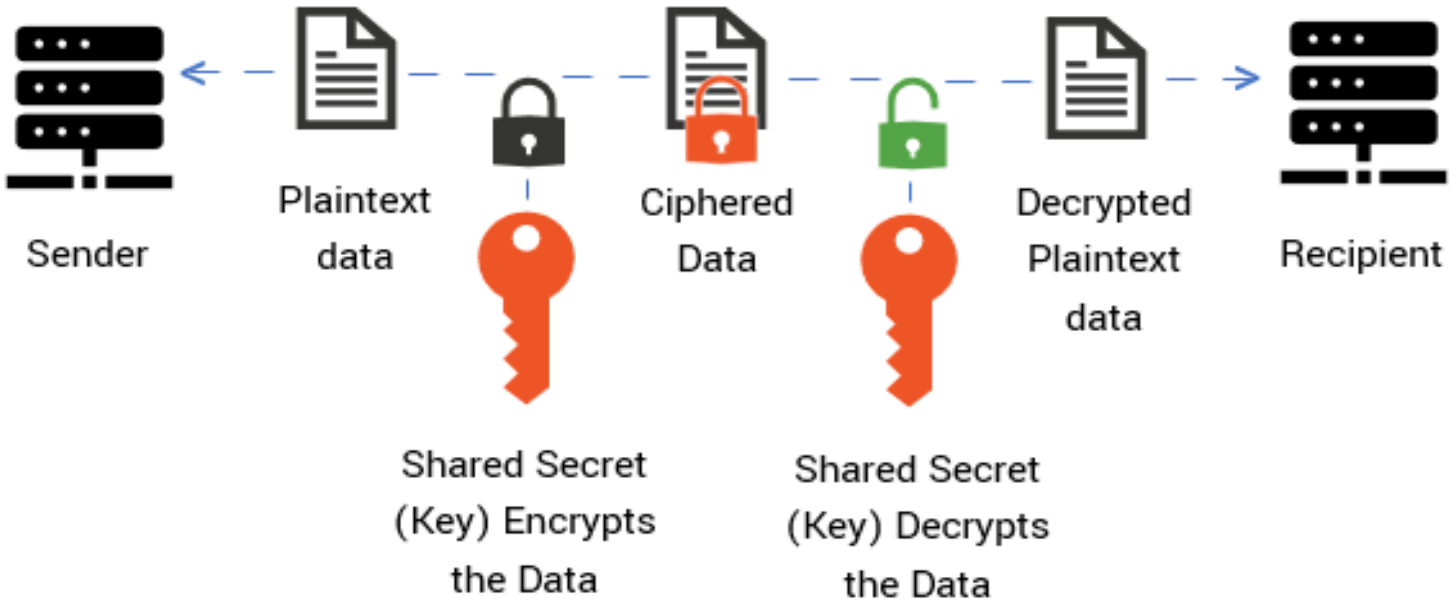
Private Key Encryption (Symmetric)



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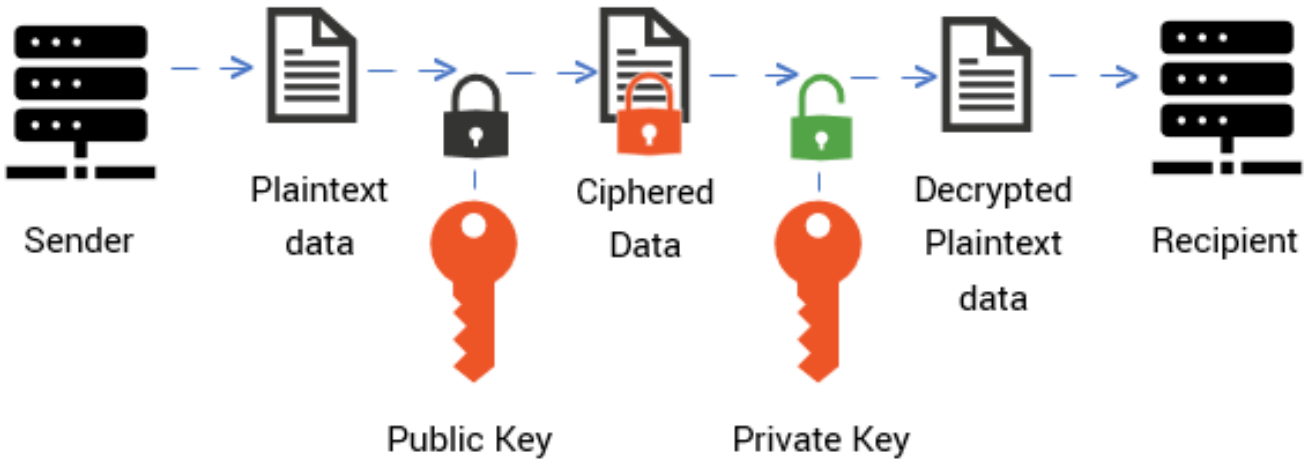
Public Key Encryption (Asymmetric)



What is Block?

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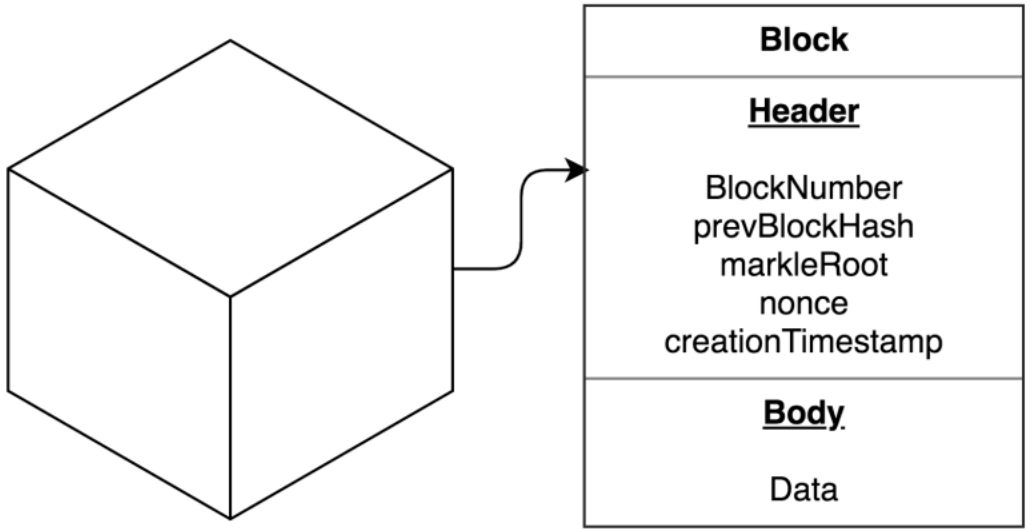
Block

– Whenever a transaction request added to unconfirmed transactions list, then that transaction will be broadcasted to all the peers

– All the peers will be validating the block and based on some consensus algorithm, they are going to add the block to the Blockchain network

A Block would be comprised of

– Timestamp
– Transaction
– Current Hash
– Previous Hash
– Nonce



How Blocks are connected in Blockchain?

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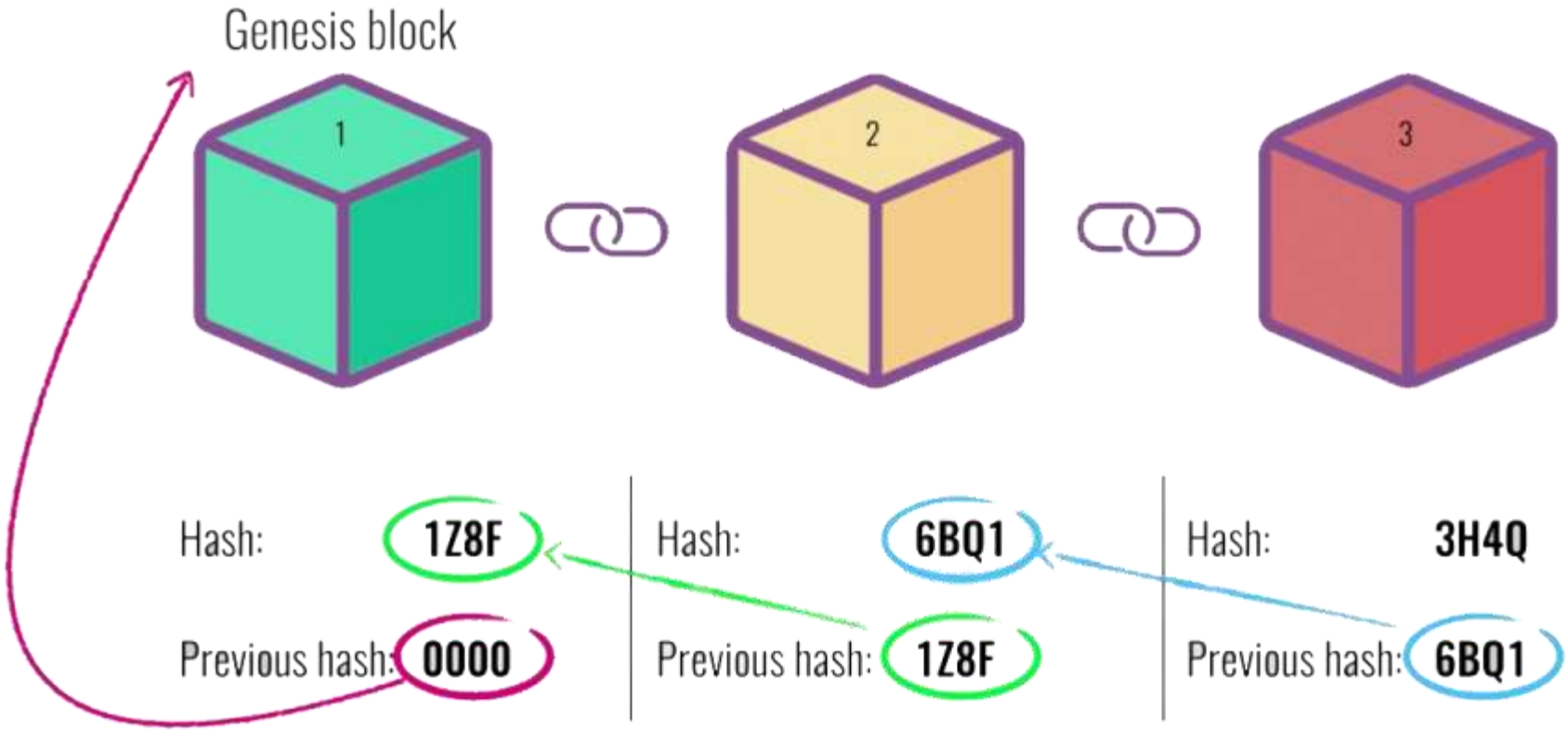

How Blocks are connected in Blockchain?

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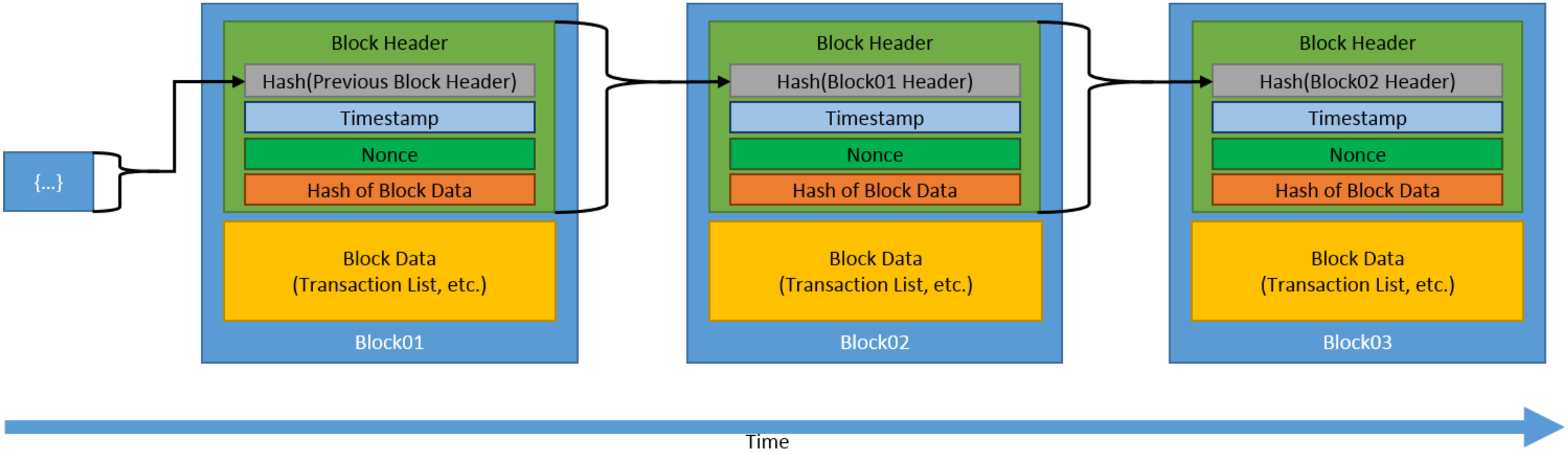

A Scenario of Blocks in the Blockchain

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A Scenario of Blocks in the Blockchain

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Hacking is possible only

when hacking is done on all the peers

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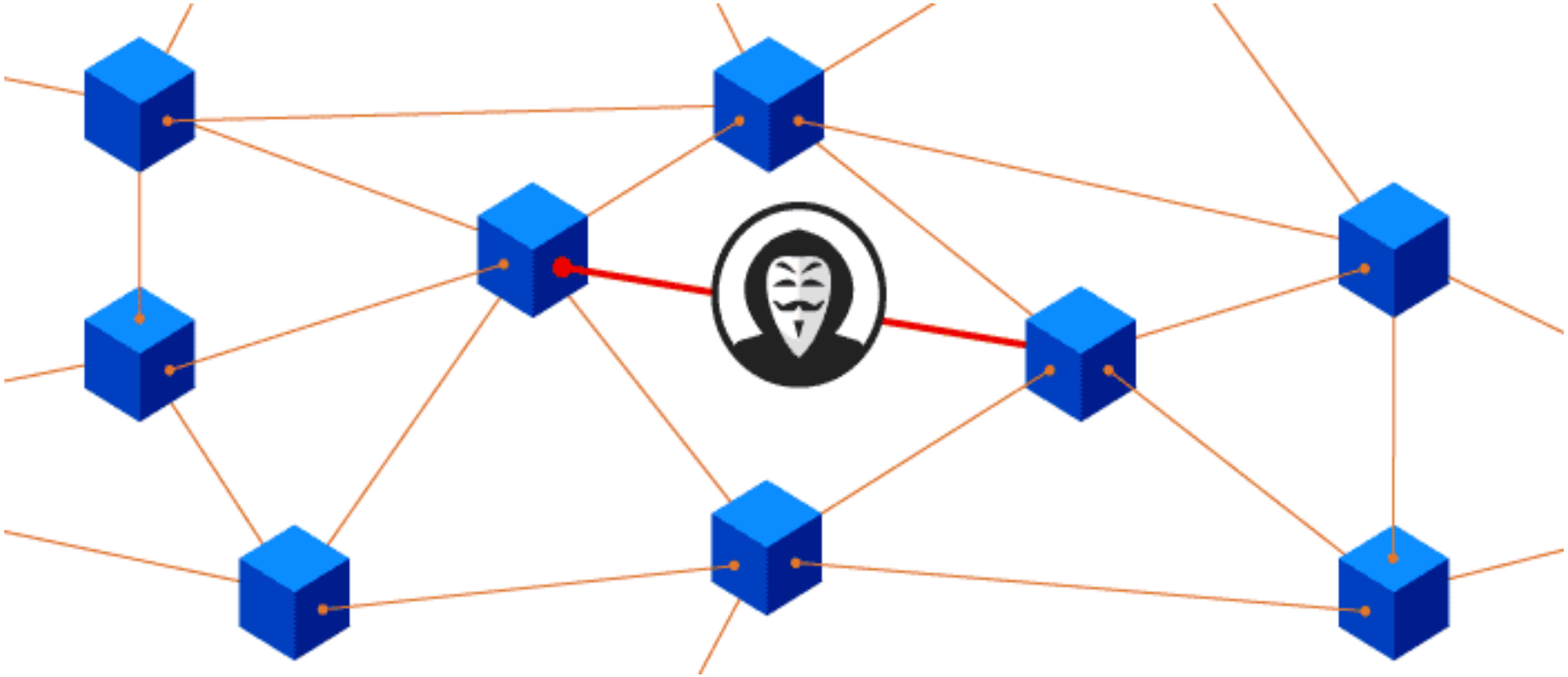

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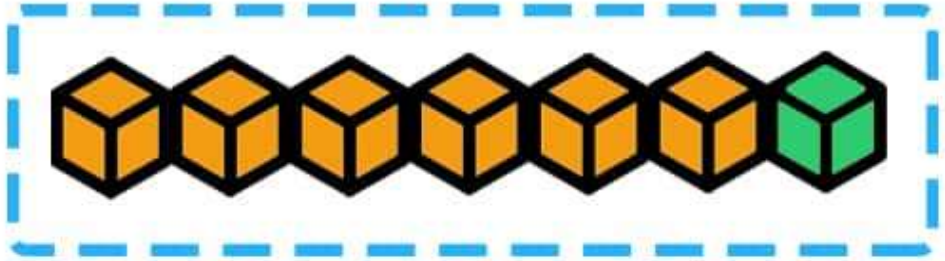
Someone requests a **transaction**.

The requested transaction is broadcast to a **P2P** network consisting of computers known as **nodes**.

The P2P network of nodes validates the transaction and the user's status using **known algorithms**.

A **verified** transaction can involve **cryptocurrency**, contracts, records, or other information.

The transaction is complete!



The new block is then added to the existing blockchain in a way that is **permanent** and **unalterable**.

Once verified, the transaction is combined with other transactions to create a new **block of data** for the **ledger**.

Cryptocurrency

Has no **intrinsic value** in that it is not redeemable for another commodity.

Has no physical form and exists **only in the network.**

Its supply is not determined by a central bank, and the network is **completely decentralized.**

How Blockchain Works?

Blockgeeks

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Summary

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Pack-Up!

– We gone through what is blockchain and the basic building blocks of Blockchain.

– Blockchain is a distributed ledger technology decentralized on a P2P network.

– The data (transactions) are encrpyted, though they are open to public they can’t understand what the data is all about.

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Tools & Pre-Requisite

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Tools of 1-Day Workshop

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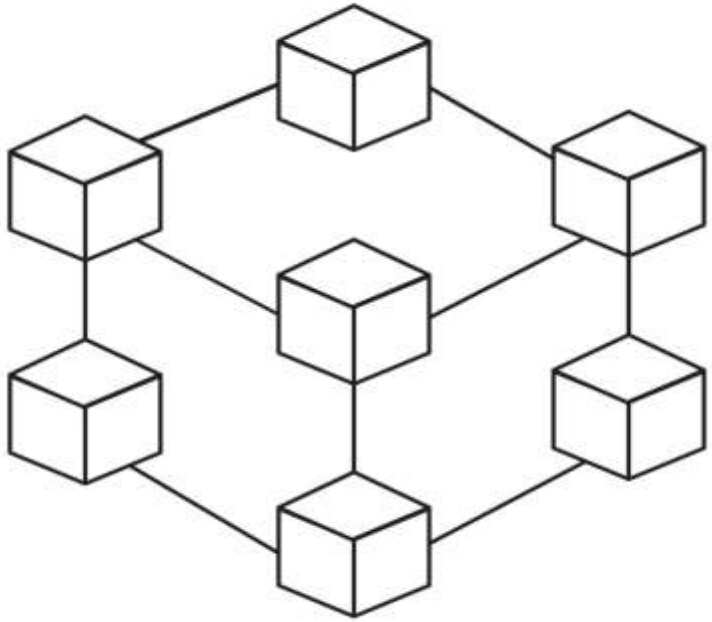
Solidity Compiler

SOLIDITY

Solidity is an object-oriented programming language for writing smart contracts. It is used for implementing smart contracts on various blockchain platforms, most notably, Ethereum.



Tools of 1-Day Workshop

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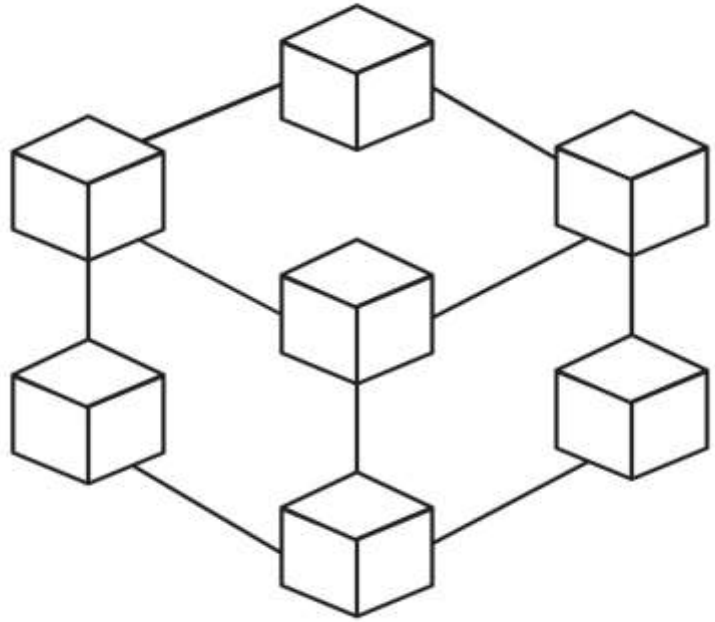
Metamask Wallet

METAMASK

MetaMask is a free and secure browser extension that allows web applications to read and interact with the Ethereum blockchain.



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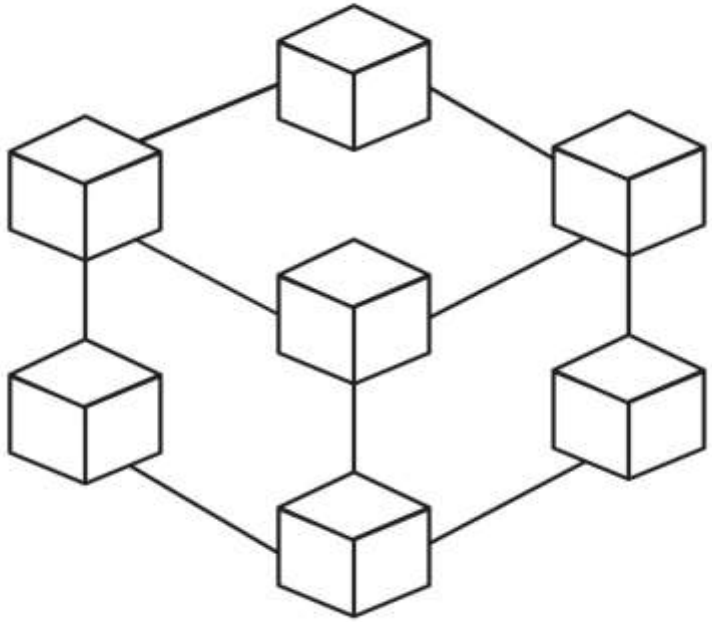
Ganache Blockchain

Ganache



Quickly fire up a personal Ethereum blockchain which you can use to run tests, execute commands, and inspect state while controlling how the chain operates.

Tools of 1-Day Workshop

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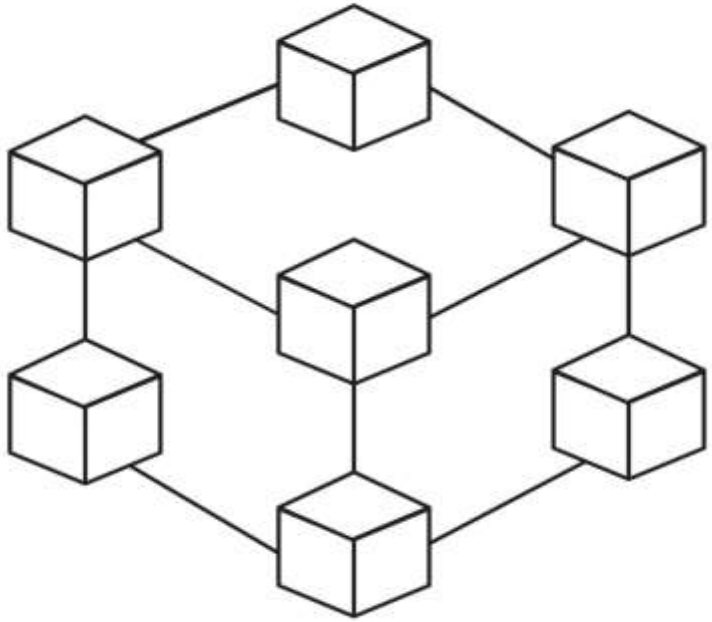
Ethereum Networks

ethereum

Ethereum is the second-largest cryptocurrency platform by market capitalization, behind Bitcoin. It is a decentralized open source blockchain featuring smart contract functionality.



Prerequisites of 1-Day Workshop

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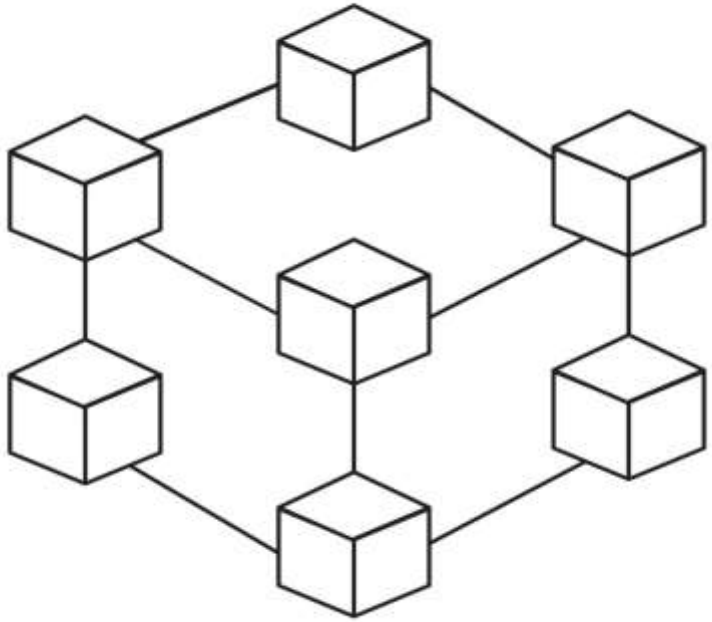
1. Basic programming knowledge on any **object-oriented programming**.

2. **Laptop/Desktop PC with minimum of**
   4GB RAM,
   500GB of Hard Disk,
   1GB of Graphics Card,
   Internet Connectivity upto 20Mbps.

3. **Ubuntu OS / Windows** (Ubuntu Recommended for Blockchain Applications)



Summary

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Pack-Up!

– We have gone through what kind of tools are required for doing hands-on and a pre-requisite needed.

– Solidity – Programming Language

– Remix – Web IDE

– Ganache – Local Ethereum Blockchain Server

– Metamask – Crypto Wallet

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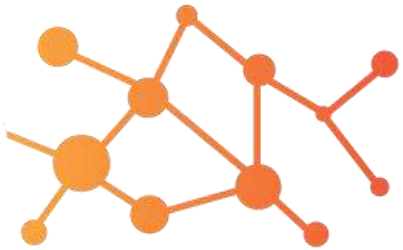
Session – 2: Creating your Crypto Wallet

For questions, write us on blockchain@madblocks.tech



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How to launch Ganache Blockchain Server on Ubuntu OS?

For questions, write us on blockchain@madblocks.tech

Launching Ganache Blockchain

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Important Steps

– Download the Ganache Server from truffle suite.

– www.trufflesuite.com/ganache

– Download it and Launch.

Ganache

ONE CLICK BLOCKCHAIN

GITHUB REPO DOCS Star 2,294

Quickly fire up a personal Ethereum blockchain which you can use to run tests, execute commands, and inspect state while controlling how the chain operates.

DOWNLOAD (LINUX)

Need another OS download?

Ganache

ONE CLICK BLOCKCHAIN

GITHUB REPO | DOCS | Star 2,294

Quickly fire up a personal Ethereum blockchain which you can use to run tests, execute commands, and inspect state while controlling how the chain operates.

DOWNLOAD (LINUX)

Need another OS download?

ganac....AppImage
3.6/146 MB, 12 mins l...

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The file will be downloaded as this

Double Click on this, and Ganache Server opens...

Ganache

v2.4.0

CREATE A WORKSPACE

Quickstart for a one-click blockchain or create a new workspace for advanced setup options.

QUICKSTART
ETHEREUM

NEW WORKSPACE
ETHEREUM

Ganache

v2.4.0

CREATE A WORKSPACE

Quickstart for a one-click blockchain or create a new workspace for advanced setup options.

Click on Quickstart Button to launch

Ganache

ACCOUNTS | BLOCKS | TRANSACTIONS | CONTRACTS | EVENTS | LOGS | UPDATE AVAILABLE | SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	MINING STATUS	WORKSPACE		
0	20000000000	6721975	MUIRGLACIER	5777	HTTP://127.0.0.1:7545	AUTOMINING	QUICKSTART	SAVE	SWITCH

MNEMONIC

coach color spin defense amazing ladder board palace palace stereo famous defy

HD PATH

m/44'/60'/0'/0/account_index

ADDRESS	BALANCE	TX COUNT	INDEX
0×F2bE4Cf9e79D695268E8085ee3aa42600aB73f96	100.00 ETH	0	0
0×249147D4AD0D2F11Cff3bD9BdcA0E7dC34761e58	100.00 ETH	0	1
0×77dfDDE1F4B988129b5ae5D88Be3630534D19e2c	100.00 ETH	0	2
0×5433C19110A73080c29609778c5830F435c21D02	100.00 ETH	0	3
0×D45e65d68D776d85B707B98998fc05e931caF53E	100.00 ETH	0	4
0×7390923332955bdb14AAE3F0e9cd4691816B165f	100.00 ETH	0	5
0×90893Ff584AeDA160835672E5D160430Df2A2fa3	100.00 ETH	0	6

Ganache

ACCOUNTS | BLOCKS | TRANSACTIONS | CONTRACTS | EVENTS | LOGS | UPDATE AVAILABLE | SEARCH FOR BLOCK NUMBERS OR TX HASHES

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MNEMONIC

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HD PATH

m/44'/60'/0'/0/account_index

ADDRESS	BALANCE	TX COUNT	INDEX
0×F2bE4Cf9e79D695268E8085ee3aa42600aB73f96	100.00 ETH	0	0
0×249147D4AD0D2F11Cff3bD9BdcA0E7dC34761e58	100.00 ETH	0	1
0×77dfDDE1F4B988129b5ae5D88Be3630534D19e2c	100.00 ETH	0	2
0×5433C19110A73080c29609778c5830F435c21D02	100.00 ETH	0	3
0×D45e65d68D776d85B707B98998fc05e931caF53E	100.00 ETH	0	4
0×7390923332955bdb14AAE3F0e9cd4691816B165f	100.00 ETH	0	5
0×90893Ff584AeDA160835672E5D160430Df2A2fa3	100.00 ETH	0	6

Summary

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1. We have downloaded the Ganache from truffle and we had quickly launched the Ganache Blockchain (Local Ethereum) Server.

2. We had identified the IP address of server along with port number as follows:

http://localhost:7545

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How to add Metamask to Google Chrome?

For questions, write us on blockchain@madblocks.tech

METAMASK

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What is MetaMask?

A crypto wallet and gateway to Blockchain Apps

MetaMask provides the simplest yet most secure way to connect to Blockchain-based applications.

MetaMask generates passwords and keys on your device, so only you have access to your accounts and data.

MetaMask provides an essential utility for Blockchain newcomers, token traders, crypto gamers and developers.

Adding Metamask

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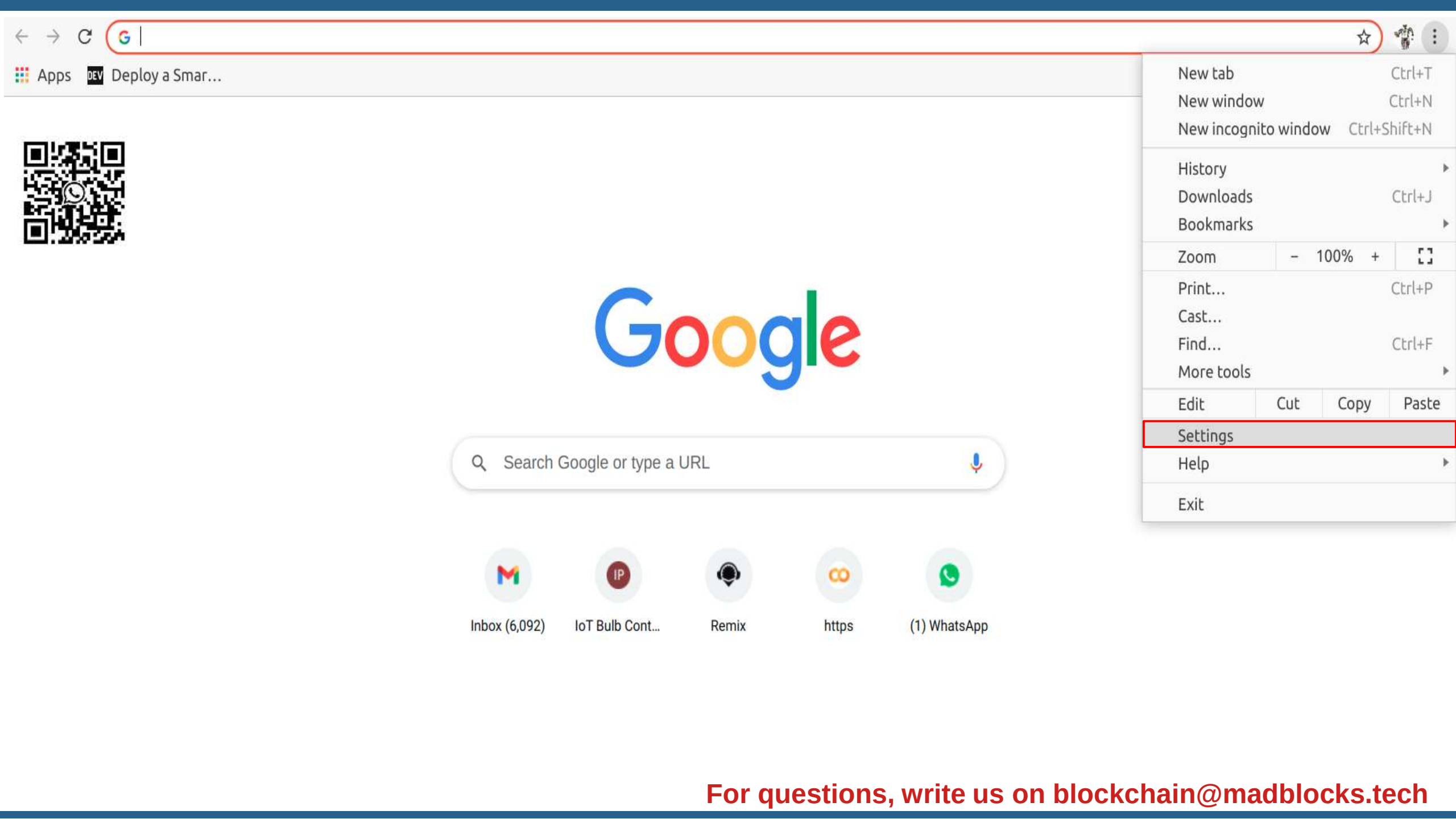
Important Steps

– Adding the Metamask extension with Google Chrome

– Search for ‘Metamask’ in Extensions Page

– Add it to Chrome

METAMASK



For questions, write us on blockchain@madblocks.tech

Settings

Search settings

You and Google

Auto-fill

Safety check

Privacy and security

Appearance

Search engine

Default browser

On start-up

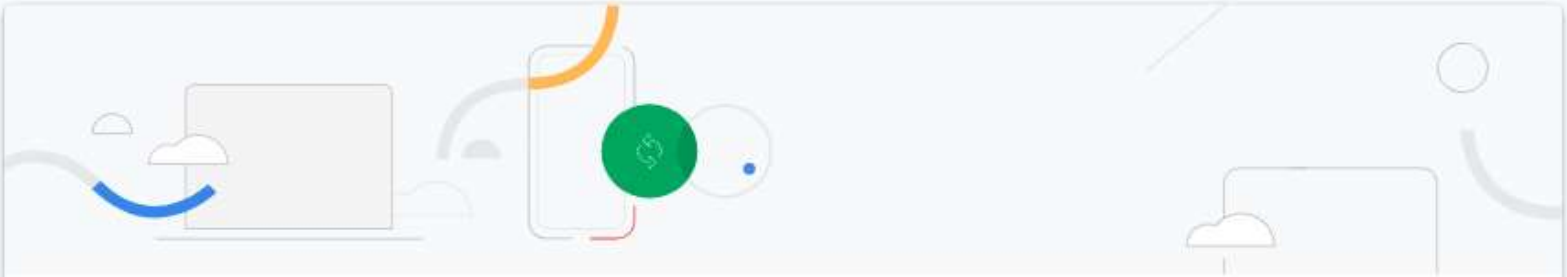
Advanced

Extensions

Opens in a new tab

About Chrome

You and Google



Get Google smarts in Chrome

Sync and personalise Chrome across your devices

Madhu Parvathaneni
parvathanenimadhu@gmail.com

Turn on sync...

Sync and Google services

Manage your Google Account

Chrome name and picture

Import bookmarks and settings

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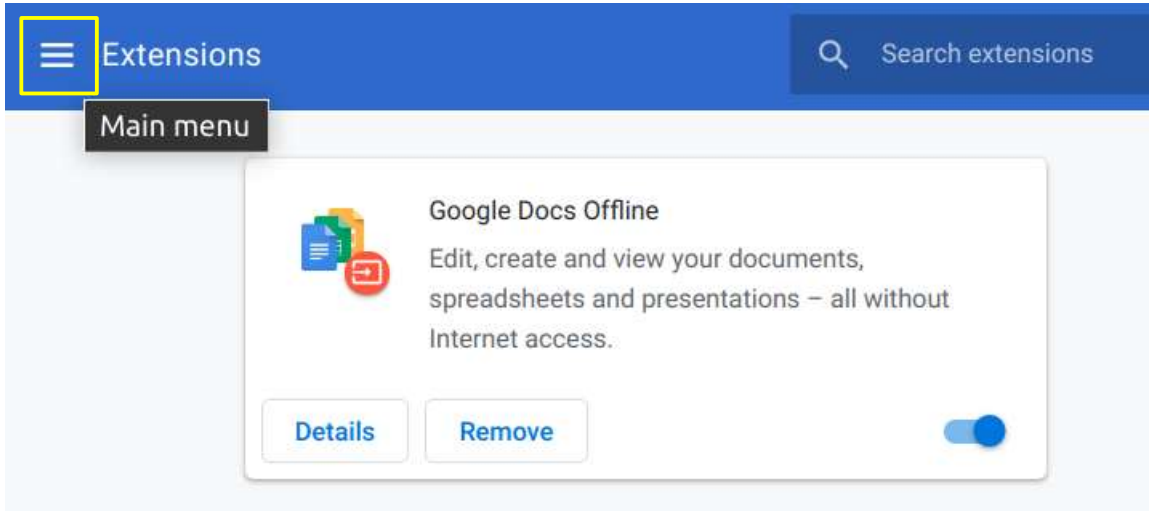
Click on the Extensions Menu



To get an access to add a new extension

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Click on Open Chrome Web Store

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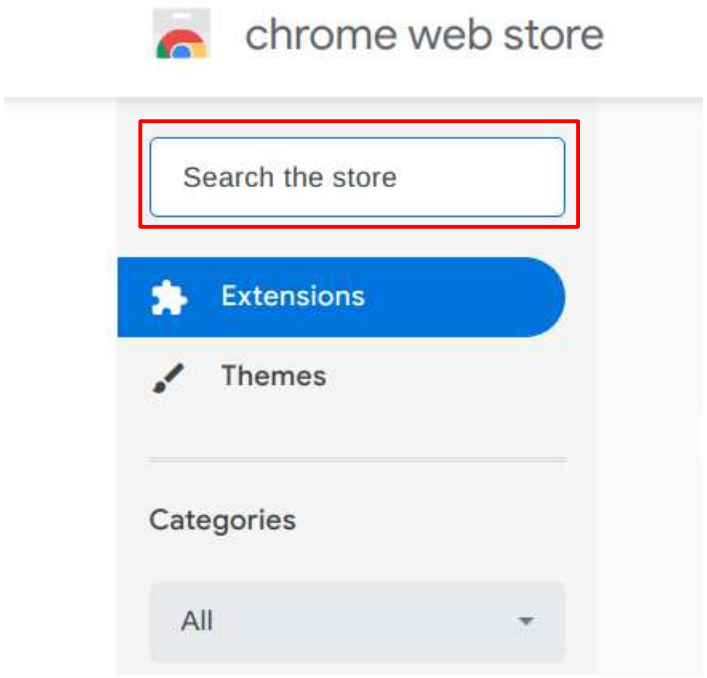

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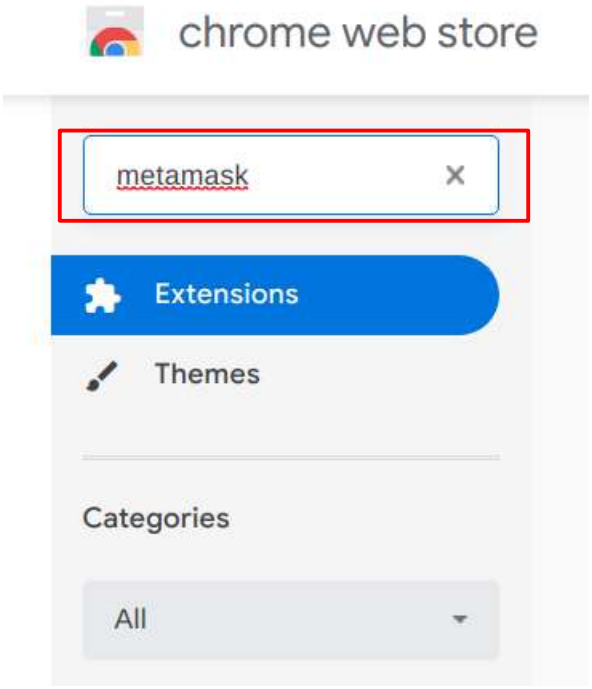

Type metamask and hit **enter**

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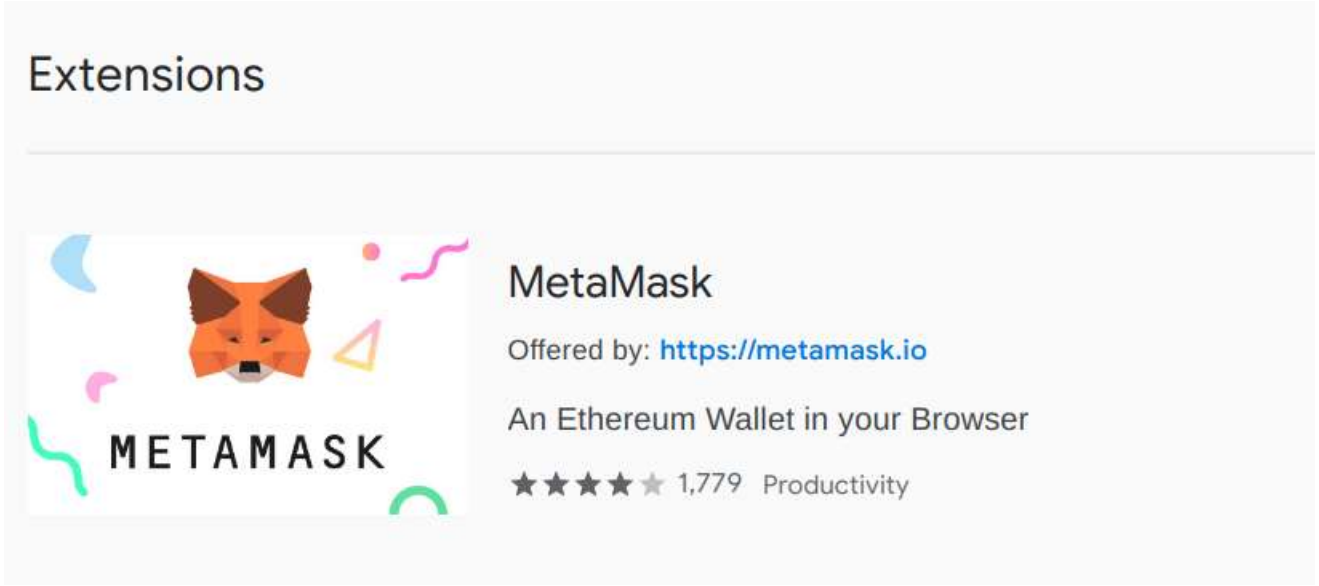

Click on this extension called **Metamask**

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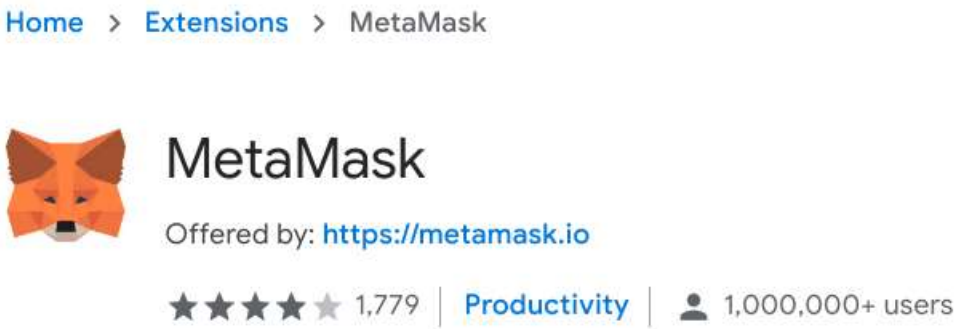
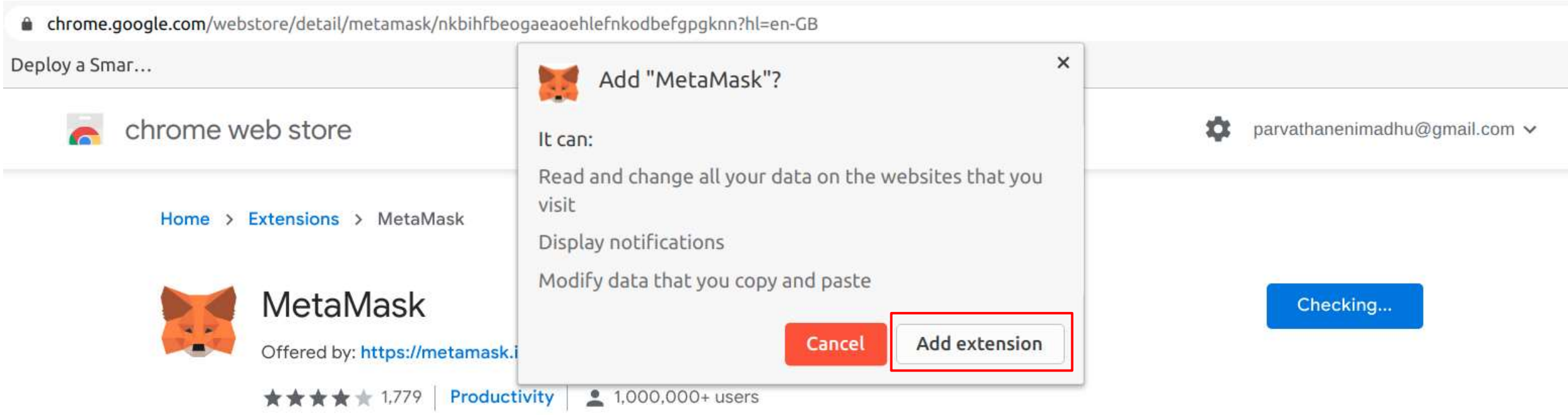


Click on **Add to Chrome**



Click on **Add extension**

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Welcome to MetaMask

Connecting you to Ethereum and the Decentralized Web.
We're happy to see you.

Get Started

Click on **Get Started**

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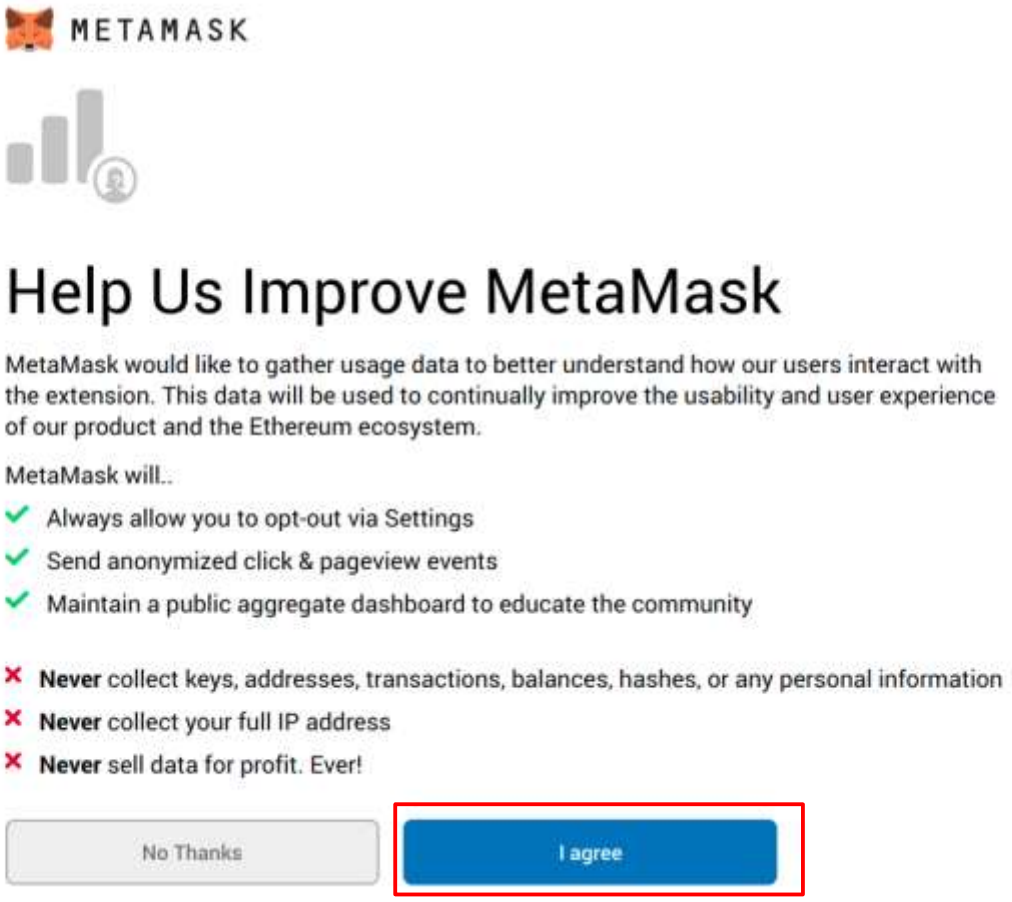

Click on **I agree**

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METAMASK

< Back

Create Password

New password (min 8 chars)

••••••••••

Confirm password

••••••••••

I have read and agree to the Terms of Use

Create

Enter some valid password
and Click on **Create**

METAMASK

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Secret Backup Phrase

Your secret backup phrase makes it easy to back up and restore your account.

WARNING: Never disclose your backup phrase. Anyone with this phrase can take your Ether forever.

Remind me later

Next

If you want to store backup phrase, you can do it but as of now it is not required.

I'll click on **Remind me later**

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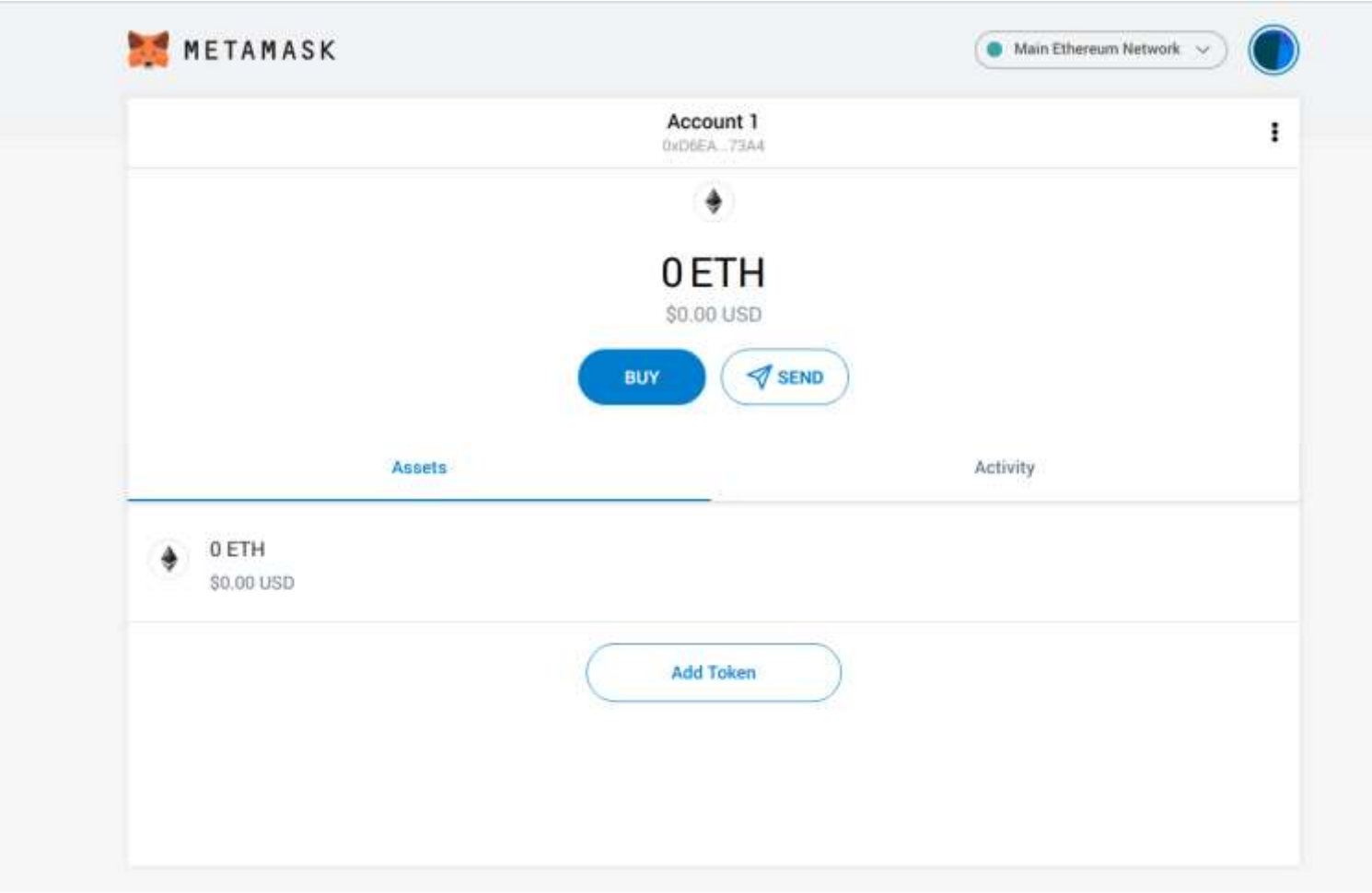

Finally, our Crypto Wallet is ready for making transactions.

Summary

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1. We have added an extension called metamask – A crypto wallet (a gateway to blockchain decentralized apps)

2. We had created a new wallet for making some blockchain transactions which was added as an extension to google chrome.

Metmask – A gateway to blockchain dApps

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How to Connect Metamask with Ganache?

For questions, write us on blockchain@madblocks.tech

Launch Ganache Server

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Important Steps

– Make sure you have downloaded Ganache Package

– Open and Launch the Ganache Server

– So, that you can connect to Metamask

Ganache

ACCOUNTS | BLOCKS | TRANSACTIONS | CONTRACTS | EVENTS | LOGS | UPDATE AVAILABLE | SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	MINING STATUS	WORKSPACE		
0	20000000000	6721975	MUIRGLACIER	5777	HTTP://127.0.0.1:7545	AUTOMINING	QUICKSTART	SAVE	SWITCH

MNEMONIC

goose decline annual river bracket clip bonus change exact canvas ball stay

HD PATH

m/44'/60'/0'/0/account_index

ADDRESS	BALANCE	TX COUNT	INDEX
0×860c7284087b16C78Bd21E17d81326eAA46514d2	100.00 ETH	0	0
0×1B0261759D53C5822D56bce826Fa654118187619	100.00 ETH	0	1
0×71f95e6B5Ae050D09DAc0898dE29824051B95470	100.00 ETH	0	2
0×E3e52268bfe6749fD84320E9102611CCDD42cc55	100.00 ETH	0	3
0×D0699760e7ff6B197a4701F43cDDC01Fd2B52B34	100.00 ETH	0	4
0×15a6FaA1053ea166F28D367Df5109dB9E1007428	100.00 ETH	0	5
0×4be0D575d96ff9224BeE1F8B2F53f1eeaD724F6a	100.00 ETH	0	6

Ganache

ACCOUNTS | BLOCKS | TRANSACTIONS | CONTRACTS | EVENTS | LOGS | UPDATE AVAILABLE | SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	MINING STATUS	WORKSPACE		
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MNEMONIC

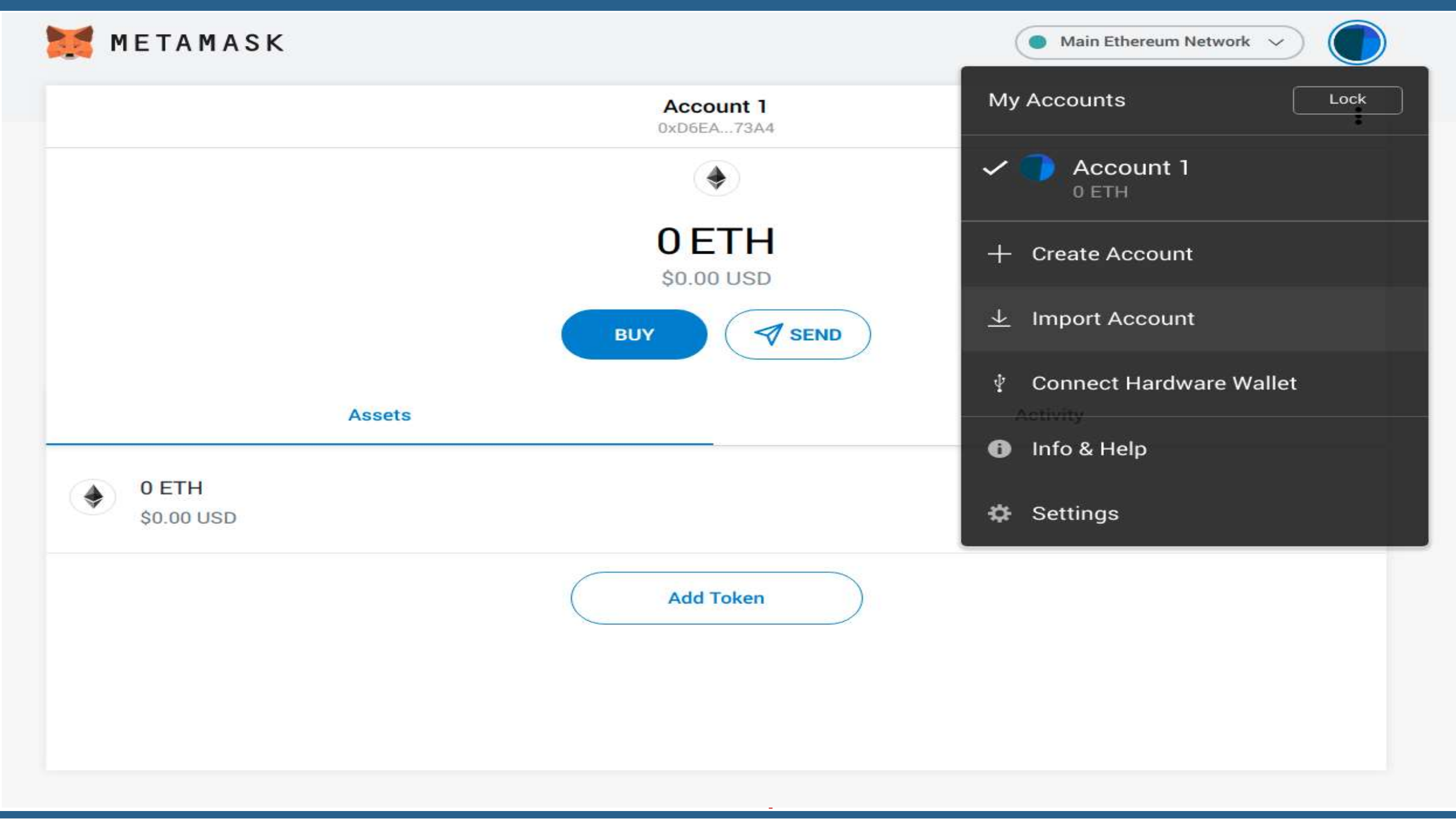
goose decline annual river bracket clip bonus change exact canvas ball stay

HD PATH

m/44'/60'/0'/0/account_index

ADDRESS	BALANCE	TX COUNT	INDEX
0×860c7284087b16C78Bd21E17d81326eAA46514d2	100.00 ETH	0	0
0×1B0261759D53C5822D56bce826Fa654118187619	100.00 ETH	0	1
0×71f95e6B5Ae050D09DAc0898dE29824051B95470	100.00 ETH	0	2
0×E3e52268bfe6749fD84320E9102611CCDD42cc55	100.00 ETH	0	3
0×D0699760e7ff6B197a4701F43cDDC01Fd2B52B34	100.00 ETH	0	4
0×15a6FaA1053ea166F28D367Df5109dB9E1007428	100.00 ETH	0	5
0×4be0D575d96ff9224BeE1F8B2F53f1eeaD724F6a	100.00 ETH	0	6

Copy the Private Key so that you can import it to the Metamask


METAMASK
Main Ethereum Network
Account 1
0xD6EA...73A4
0 ETH
$0.00 USD
BUY
SEND
Assets
Activity
0 ETH
$0.00 USD
Add Token
My Accounts
Lock
Account 1
0 ETH
Create Account
Import Account
Connect Hardware Wallet
Info & Help
Settings

METAMASK

Main Ethereum Network

Create | Import | Hardware

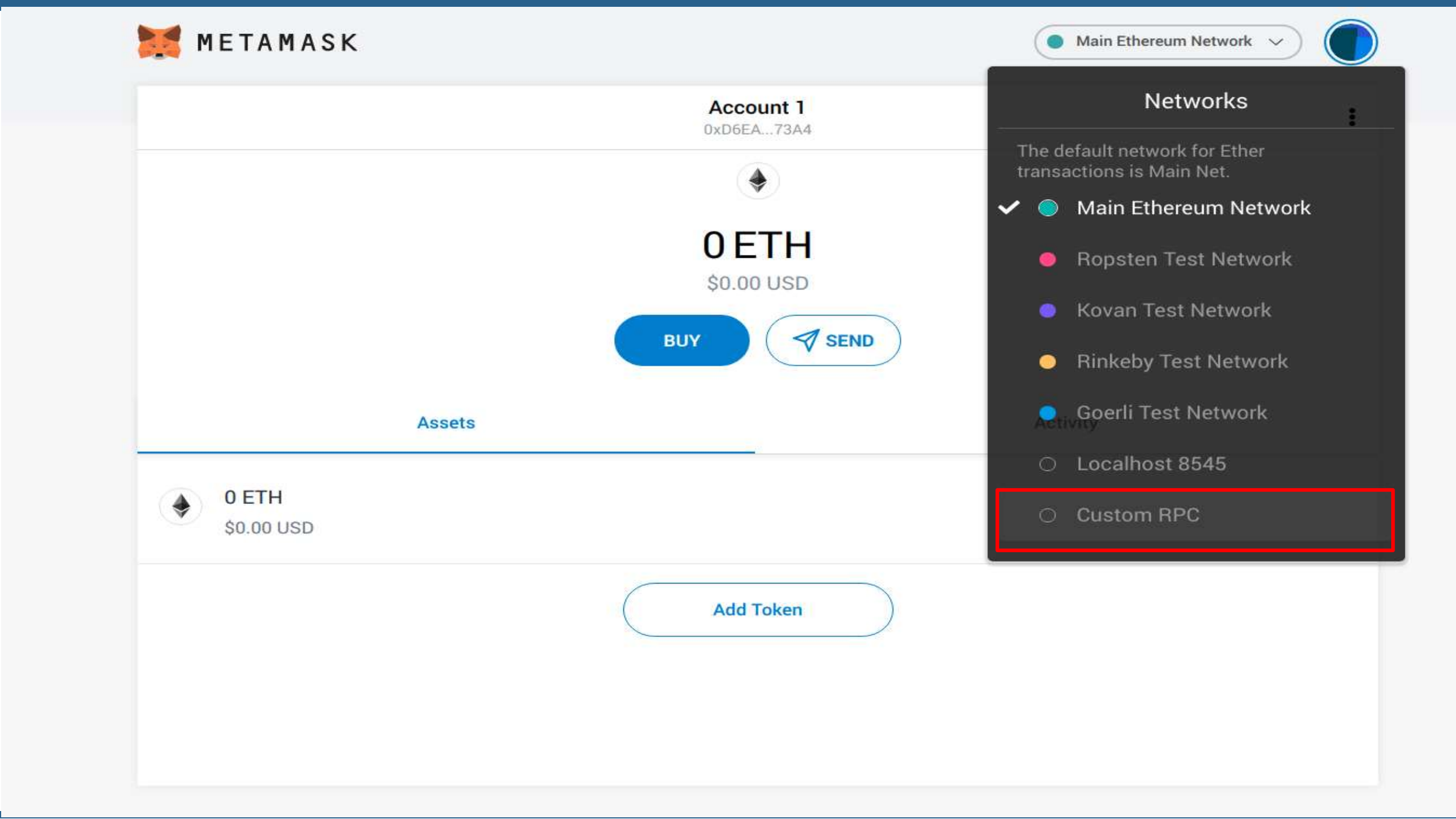
Imported accounts will not be associated with your originally created MetaMask account seedphrase. Learn more about imported accounts here

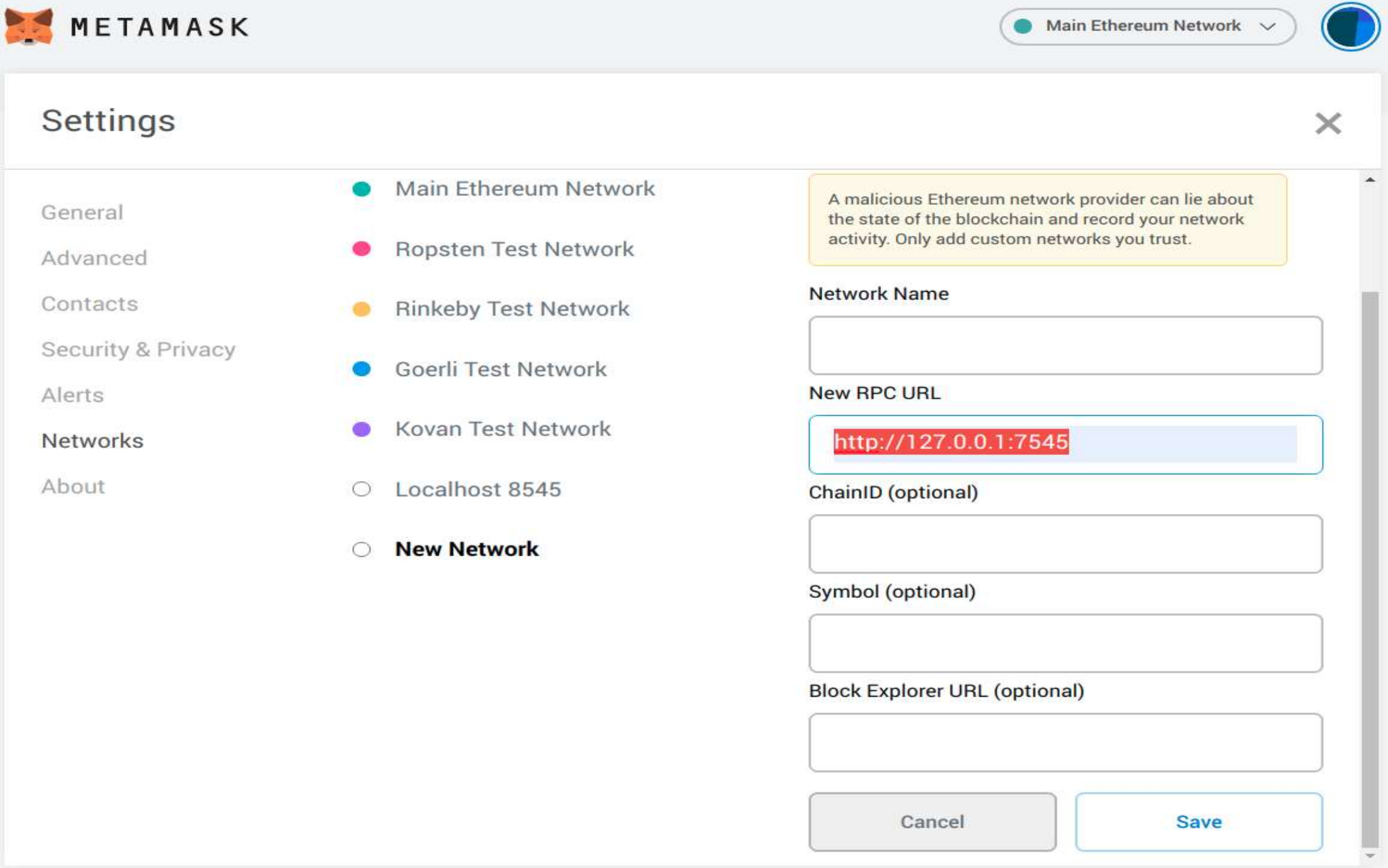
Select Type: Private Key

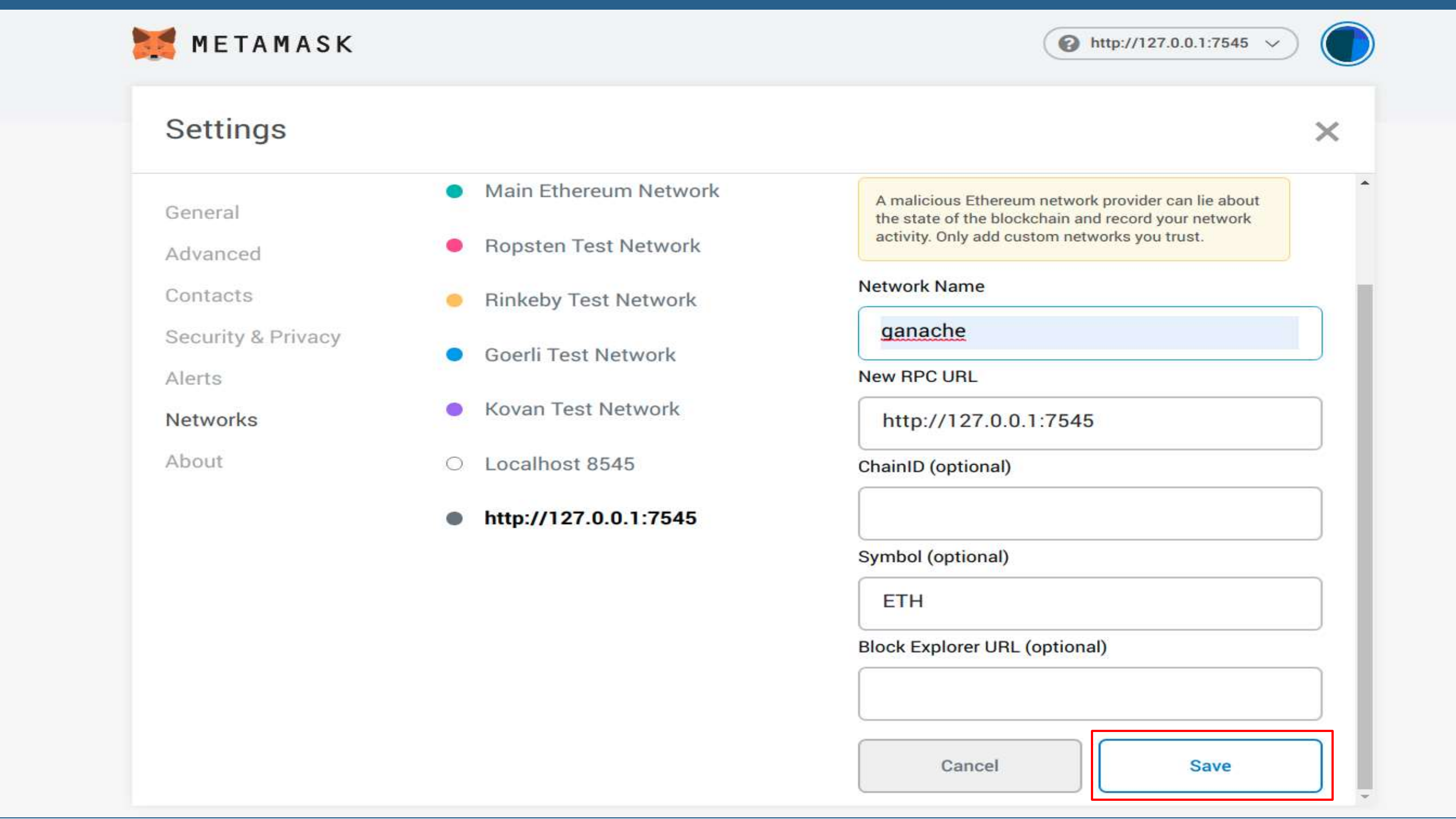
Paste your private key string here:

••

Cancel | Import


METAMASK
Main Ethereum Network
Account 1
0xD6EA...73A4
0 ETH
$0.00 USD
BUY
SEND
Assets
Activity
0 ETH
$0.00 USD
Add Token
Networks
The default network for Ether transactions is Main Net.
Main Ethereum Network
Ropsten Test Network
Kovan Test Network
Rinkeby Test Network
Goerli Test Network
Localhost 8545
Custom RPC


METAMASK
Main Ethereum Network
Settings
General
Advanced
Contacts
Security & Privacy
Alerts
Networks
About
Main Ethereum Network
Ropsten Test Network
Rinkeby Test Network
Goerli Test Network
Kovan Test Network
Localhost 8545
New Network
A malicious Ethereum network provider can lie about the state of the blockchain and record your network activity. Only add custom networks you trust.
Network Name
New RPC URL
http://127.0.0.1:7545
ChainID (optional)
Symbol (optional)
Block Explorer URL (optional)
Cancel
Save


METAMASK
http://127.0.0.1:7545
Settings
General
Advanced
Contacts
Security & Privacy
Alerts
Networks
About
Main Ethereum Network
Ropsten Test Network
Rinkeby Test Network
Goerli Test Network
Kovan Test Network
Localhost 8545
http://127.0.0.1:7545
A malicious Ethereum network provider can lie about the state of the blockchain and record your network activity. Only add custom networks you trust.
Network Name
ganache
New RPC URL
http://127.0.0.1:7545
ChainID (optional)
Symbol (optional)
ETH
Block Explorer URL (optional)
Cancel
Save

METAMASK

ganache

Account 2

0x860c...14d2

100 ETH

BUY

SEND

Assets

Activity

100 ETH

Add Token

Summary

1. We have connected our metamask with Ganache for transactions on Ganache IP Address and Port number.

2. We had imported an account into metamask with 100 test ethers for doing transactions.

http://localhost:7545

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Session – 3: Smart Contracts

For questions, write us on blockchain@madblocks.tech

Smart Contract

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What is a Smart Contract?

– Smart Contracts are self-executing, business automation applications that run on a decentralized network of a Blockchain.

– Smart Contracts give you:

- Autonomy (Eradicate the third party)
- Trust (No one can stole or tamper)
- Savings (No agents in between parties)
- Safety (Difficulty to hack)
- Efficiency (Saving lot of time)

What is Solidity?

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What is Solidity?

– Solidity is an object-oriented programming language used to write smart contracts on Ethereum Blockchain.

– Solidity is influenced by C++, Python and JavaScript to target Ethereum Virtual Machine (EVM).

– Solidity Compiler will convert the program into byte code which can be executed by EVM and then deployed on to a Blockchain network.

What is Remix IDE?

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Remix is a powerful, open source tool that helps you write Solidity contracts straight from the browser. Written in JavaScript, Remix supports both usage in the browser and locally.

Remix also supports testing, debugging and deploying of smart contracts and much more.

Yahoo! We are ready to create our first Smart Contract.

Options in Remix IDE

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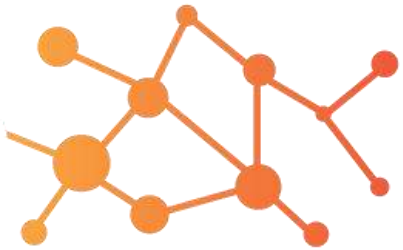
File Explorer – This is an option available on Remix IDE to handle various files associated to a Smart Contract.

Solidity Compiler – This is an option available on Remix IDE to compile the solidity file and push if any errors

Deploy & Run – This is an option available on Remix IDE to deploy and run the smart contract

Let’s walk-through at http://remix.ethereum.org



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Syntaxes and Data Types

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pragma

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pragma is a keyword in Solidity programming language enables certain compilation features

Syntax:

pragma solidity compiler_version;

For example:

pragma solidity 0.6.6;

Comments

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Comments are programmer friendly and Solidity supports comments as C/C++ language

1. Single Line Comment

Syntax:

```
// This line is commented
```

2. Multiple Line Comment

Syntax:

```
/*
 These are the multiple lines
 are commented
*/
```

Data Types

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Type of data that involves in Solidity Programming

1. Boolean - bool
2. Unsigned Integer – uint8 to uint256 – uint
3. Signed Integer – int8 to int256 – int
4. Fixed Point Numbers – fixedMxN – M bits, N decimal points
5. Unsigned Fixed Point Numbers – ufixedMxN
6. Address – address - 20 byte value

Fixed Point Numbers / Unsigned Fixed Point Numbers
M should be divisible by 8 (8 to 256)
N should be in range 0 to 80

Variables

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Variables are identifiers where you can store a value

1. State Variables
   - whose values are permanently stored in contract storage

1. Local Variables
   - whose values are accessible till function is executing

3. Global Variables
   - whose values are accessible through the Blockchain

1. **Variable Declaration**
2. **Variable Definition**
3. **Variable Initialization**
4. **Variable Assignment**

Scope of Variables

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Local Variable scope lies within the function whereas the State Variable scopes are of following:

1. public
   - Both internal and external access through function calls

1. internal
   - only internal access within the contract or derived contracts

3. private
   - only internal access within the contract

Syntax:

dataType scope var_name;

Operators

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Operator is used to perform operation. There were different types of operators same as C/C++. Let's see what are they:

1. Arithmetic Operators
   - +, - , *, /, %, ++, --

1. Comparison Operators
   - ==, !=, >, <, >=, <=

3. Logical Operators
   - &&, ||, !

4. Bitwise Operators
   - &, |, ~, ^, <<, >>

5. Assignment Operators
   - =, +=, -=, *=,/=, %=

6. Conditional Operator
   - ?:

Loops

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A branch of statements gets executed over and over.
The following were the loops available:

1. while Loop

1. do…while Loop

3. for Loop

4. Loop Control
   - break
   - continue

Decision Making

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A branch of statements gets executed on a condition check.
The following were available:

1. if statement

1. if…..else statement

3. if……else if statement

Strings

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Solidity supports string literals using either double quote or single quote.

Syntax:

string data='text';

1. \r – Carriage Return
1. \n – new line
3. \\ - Backslash
4. \t – tab space
5. \x – Hexadecimal Value

Arrays

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Collection of values of similar dataType same as arrays in C programming language

Syntax:

```
uint[3] a = [1,2,3];
```

You can access the members of the array through index.
Index value starts with 0
You can also create both static and dynamic arrays

enums

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The values in the enumerated list are called enums

Syntax:

enum madhu {ORANGE, MANGO, APPLE}

madhu ms;
ms=madhu.ORANGE // 0
ms=madhu.MANGO // 1
ms=madhu.APPLE // 2

structures

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Collection of values of different dataType same as structures in C programming language

Syntax:

```
struct abc
{
        string a;
        uint b;
}
```

You can access the members of the structure through structure variable.
You can use dot operator to access its members

ethers

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Lets look at the denomination of ethers

1. 1 wei = 1
1. 1 sazboo = 1e12
3. 1 finney = 1e15
4. 1 ether = 1e18

Functions

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Group of reusable code which can be called anywhere throughout the program which is same as functions in C/C++

Syntax:

```
function function_name (parameters) scope returns () {
        _____
        _____
        _____
}
```

function definition has to be created before you make a function call
scope – public/private/view/pure

Function Calls

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If you want to execute a branch of reusable code, then you have to make a function call so that the branch will gets executed.

Syntax:

```
function function_name (parameters) scope returns () {
        _____
        _____
        _____
}

function_name(parameters);
```

Function Modifier

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Function Modifiers are the modifiers which modifies the function behaviour and they were widely used in Smart Contracts.

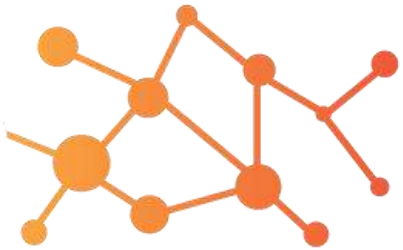
Syntax:

```
modifier modifierName {
        require (parameters);
        _;
}
```

Summary

1. We have understood what are the syntaxes and operations available in Solidity programming language.

2. We had gone through various examples in understanding solidity programming language.



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Creating a Smart Contract

For questions, write us on blockchain@madblocks.tech

Lets create your first smart contract

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Step – 1: Open your Remix IDE

Lets create your first smart contract

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Step – 1: Open your Remix IDE

Step – 2: Delete all the temporary files and create new sol file

Lets create your first smart contract

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Step – 1: Open your Remix IDE

Step – 2: Delete all the temporary files and create new sol file

Step – 3: Create a Smart Contract on basic bank balance

Lets create your first smart contract

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Step – 1: Open your Remix IDE

Step – 2: Delete all the temporary files and create new sol file

Step – 3: Create a Smart Contract on basic bank balance

Step – 4: Compile your program

Lets create your first smart contract

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Technology:Innovation:Business

Step – 1: Open your Remix IDE

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Step – 3: Create a Smart Contract on basic bank balance

Step – 4: Compile your program

Step – 5: Deploy it on JavaScript Virtual Machine

Lets create your first smart contract

madBlocks
Technology:Innovation:Business

Step – 1: Open your Remix IDE

Step – 2: Delete all the temporary files and create new sol file

Step – 3: Create a Smart Contract on basic bank balance

Step – 4: Compile your program

Step – 5: Deploy it on JavaScript Virtual Machine

Step – 6: Deploy it on Ganache

Lets create your first smart contract

madBlocks
Technology:Innovation:Business

Step – 1: Open your Remix IDE

Step – 2: Delete all the temporary files and create new sol file

Step – 3: Create a Smart Contract on basic bank balance

Step – 4: Compile your program

Step – 5: Deploy it on JavaScript Virtual Machine

Step – 6: Deploy it on Ganache

Hey, Smart Contract is Up !!!!

Demonstrations

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Election Voting Dapp:

This Decentralized application focuses on election voting where only one vote has to be casted from one account and instant result can be easily produced. All the data gets stored in the blockchain network.

Registration Dapp:

This Decentralized application focuses on basic registration data which is generally required for any decentralized app. All the data gets stored in the blockchain network.

You can clone from **https://github.com/madblocksgit**

Summary

1. We have understood how to create and deploy a smart contract and also we have created a basic contract.

2. Decentralized applications which gets connected to blockchain server and works like a centralized where there will be a blockchain instead of a normal database.