

Zero To Dapp

Onboarding the next wave of builders across the world

Abena, Rob and Simon

ETHAccra, Ethereum Remix, The Graph

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- **What Is Zero To Dapp?**
- **How Did It Start?**
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What Is Zero To Dapp?

- First edition before **ETHSanFrancisco 2022**
- Longer guided **hands-on** workshop
- Each partner-session **builds up onto** the last one
- ~30 minutes theory followed by ~30 minutes execution



ETHSanFrancisco 2022

What Is Zero To Dapp?

- Found a way to ETHAccra 2023
- **Collaboration** between **different protocols / projects**
- Build a dapp from **scratch within a day or two**



ETHAccra Hackathon

WHAT Is ETHAccra?

- Premier Ethereum hackathon in West Africa.
- Is a hub for **curious individuals** to enter the **Ethereum universe**.
- Our goal is simple: **to combine international people** with **local diverse** minds to foster the creation of unique **new innovations**.



WHY ARE WE DOING THIS?

- Accelerate and **promote** the **education** and **opportunities** of a **new era of developers**.
- Bring new **perspectives into web3** conversation globally by **fostering communities** in Ghana, West Africa.
- Providing an **appealing opportunity** for companies to access an **emerging market**.

HOW DID WE START?

- **Identified** an opportunity in 2023
- **Curious individuals** who have a passion for **hackathons** and **community building**.
- Vision **to enable appealing** for opportunities for anyone to enter **Ethereum universe**.

HOW ARE WE DOING IT?

- **Execute** annual **3-day in-person** hackathon in Accra
- **Collaboration** with local web2/web3 communities
 - Python Ghana, React Ghana, Swiss Embassy
- **Educational** events with **local universities**
 - KNUST, University of Ghana, Cape Coast
- Collaboration with **leading Ethereum projects**
 - The Graph, Optimism, Celo, NEAR, EF, Build Guidl, H.E.R DAO
- Periodic Meetups to **foster community engagement**

WHAT HAVE WE ACHIEVED SO FAR ?

2023



125 Attendees



97 Hackers



18 Projects



5 Sponsors



USD 10K

2024



175 Attendees



135 Hackers



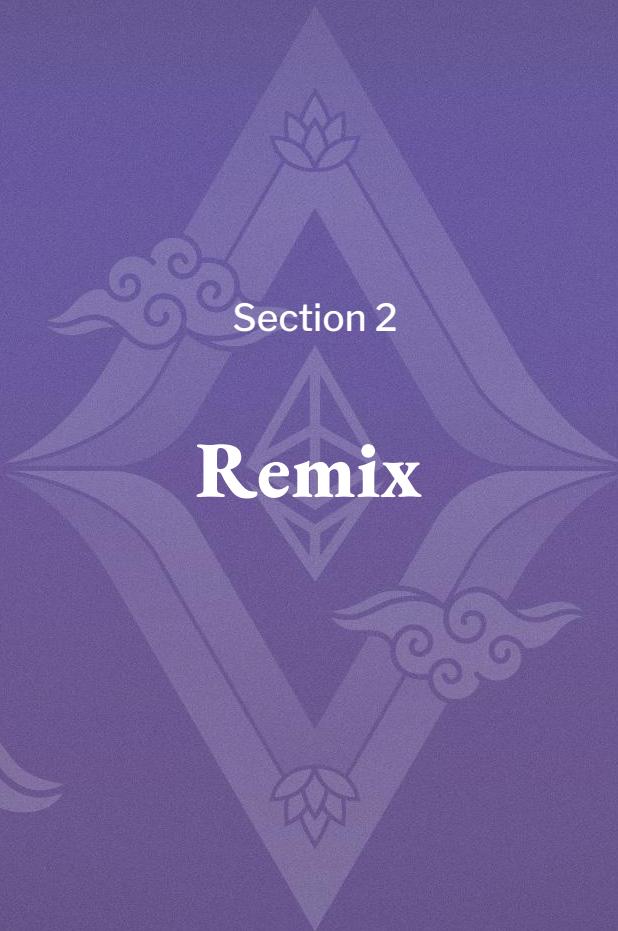
27 Projects



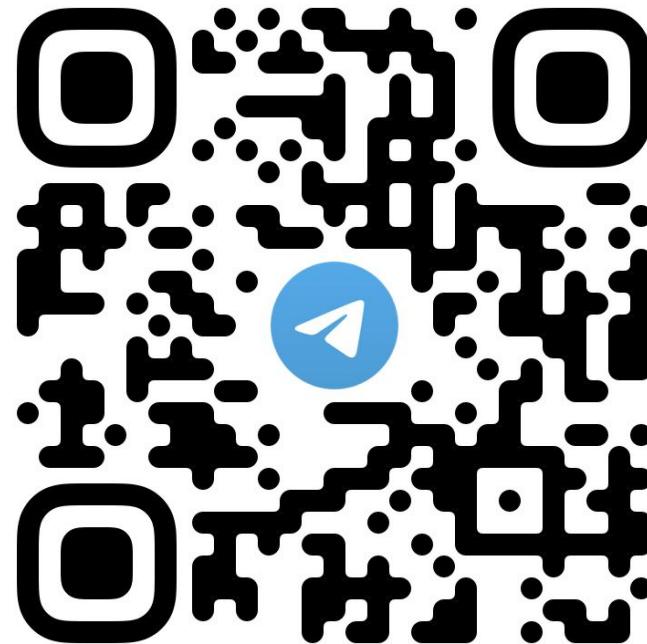
10 Sponsors



USD 23K



Join Telegram Group



What is involved in developing Smart Contracts?

- Adapting existing smart contracts and writing your own
- Compile the code
- Checking the code for errors and warnings & finding bugs
- Deploying the compiled code on a blockchain
- Verifying the contract
- Interacting with deployed contracts
- Learning & getting help



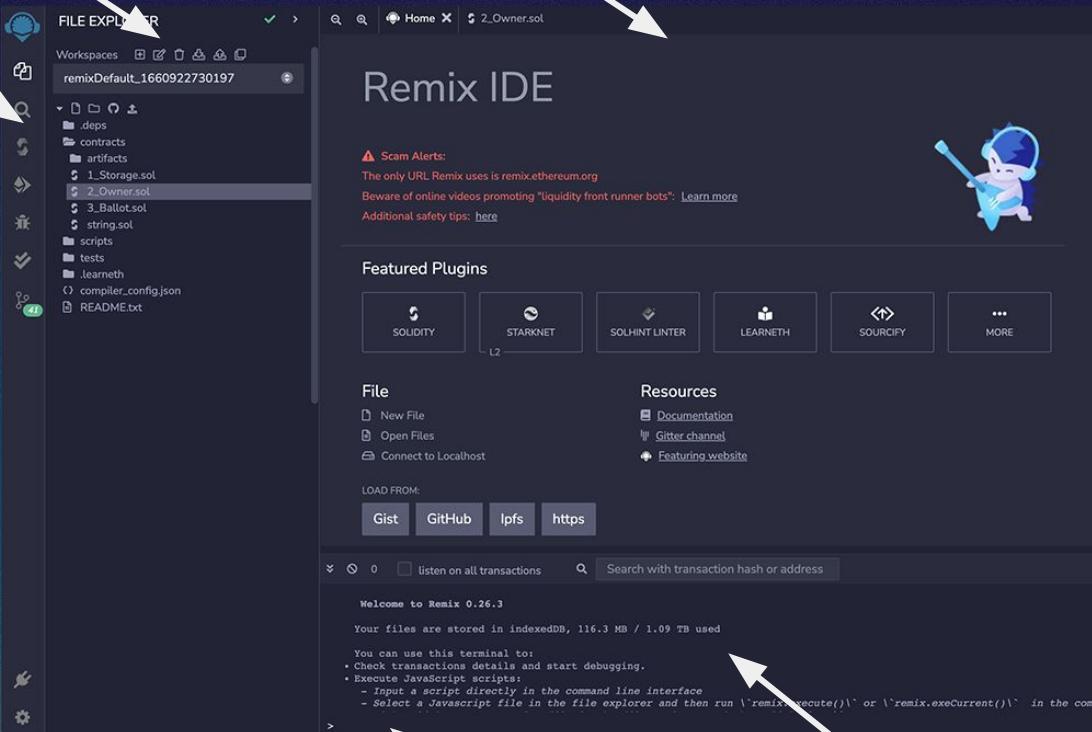
REMIX

remix.ethereum.org

Side Panel

Icon Panel

Home tab in
the Main Panel



Don't forget
about these
icons!

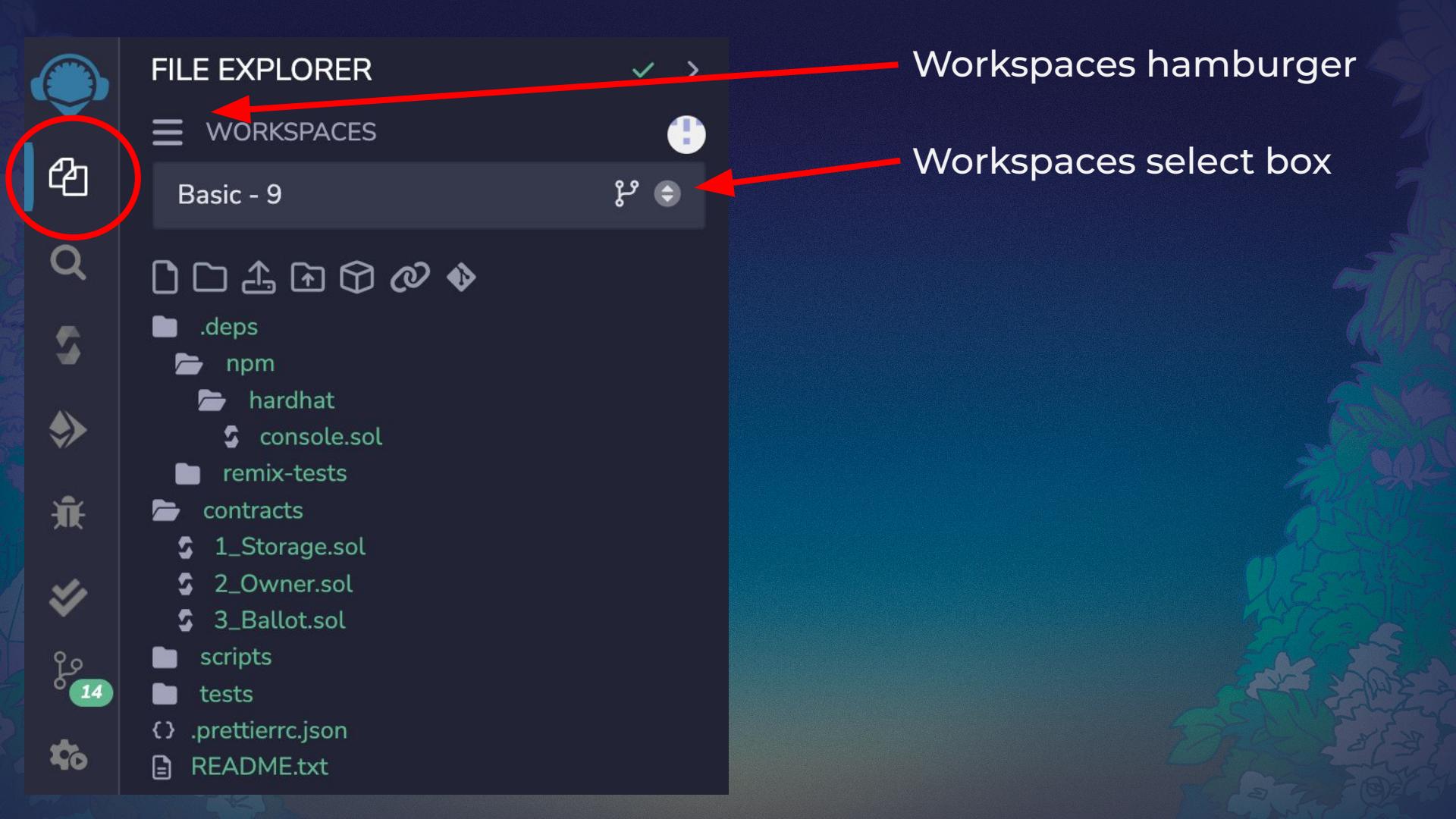
(plugin
manager and
settings)

Console

Terminal

Files from Templates

Adapting other contracts
(even the basic Remix contracts)





FILE EXPLORER

✓ >

WORKSPACES



+ Create Blank

+ Create Using Template

Clone

Rename

Download

Delete

Connect to Local Filesystem

Publish to Gist

Delete All

Backup

Restore



FILE EXPLORER

>



Template Selection

WORKSPACES

ERC20 - 2

<

>



Generic

BASIC

The default project

Create

Add to current

BLANK

A blank project

Create

Add to current

OpenZeppelin

ERC20

A simple fungible token contract

Create

Add to current

ERC20

An ERC20 contract with:
mintable

Create

Add to current

ERC20

An ERC20 contract with:
mintable burnable

Create

Add to current

ERC20

An ERC20 contract with:
mintable pausable

Create

Add to current

ERC721 (NFT)

An simple non-fungible token (NFT) contract

Create

Add to

ERC721 (NFT)

An ERC721 contract with:
mintable burnable

Create

Add to current

ERC721 (NFT)

An ERC721 contract with:
mintable pausable

Create

Add to current

ERC1155

A simple multi token contract

Create

Add to current

ERC1155

An ERC1155 contract with:
mintable

Create

Add to current

ERC1155

An ERC1155 contract with:
mintable burnable

Create

Add to

<

0



Listen on all transactions

CALL [call] from: 0x5B38Da6a701c568545dCfcB03FcB875f56beddC4 to: YourContract.purpose() data: 0x707...40aab

>



Cloning repos



FILE EXPLORER

✓ >

WORKSPACES



+ Create Blank

+ Create Using Template

Clone

Rename

Download

Delete

Connect to Local Filesystem

Publish to Gist

Delete All

Backup

Restore



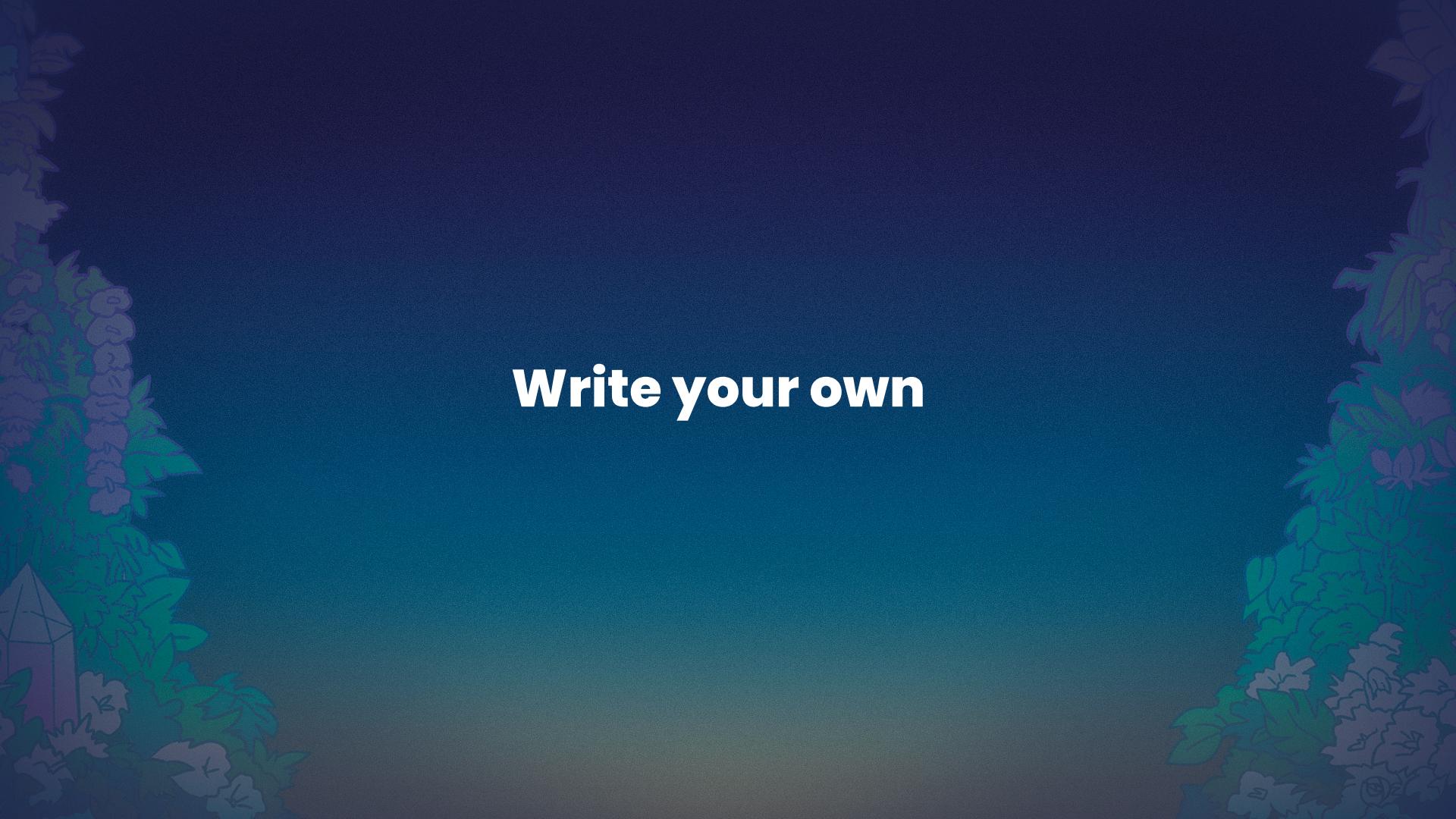
Clone Git Repository

X

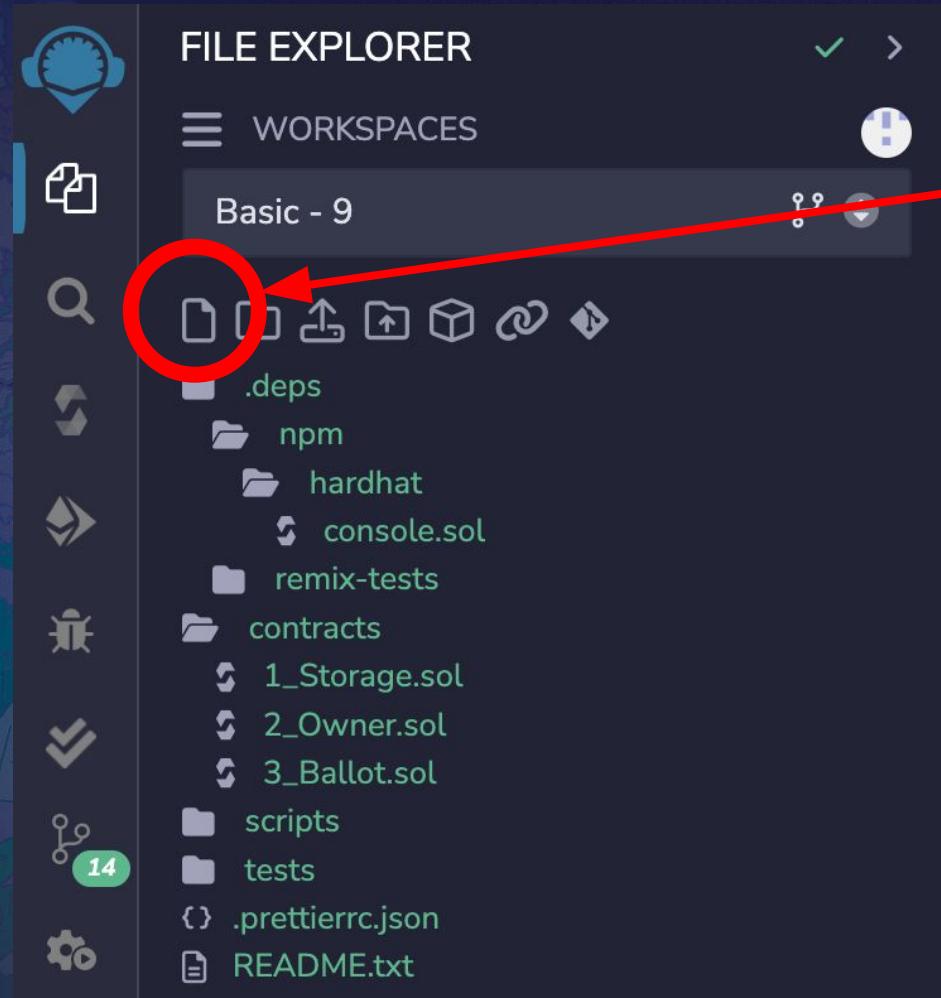
`https://github.com/samnang/solidity-examples.git`

OK

Cancel



Write your own



Saving

or

Where did that file go?

Saving your files in Remix

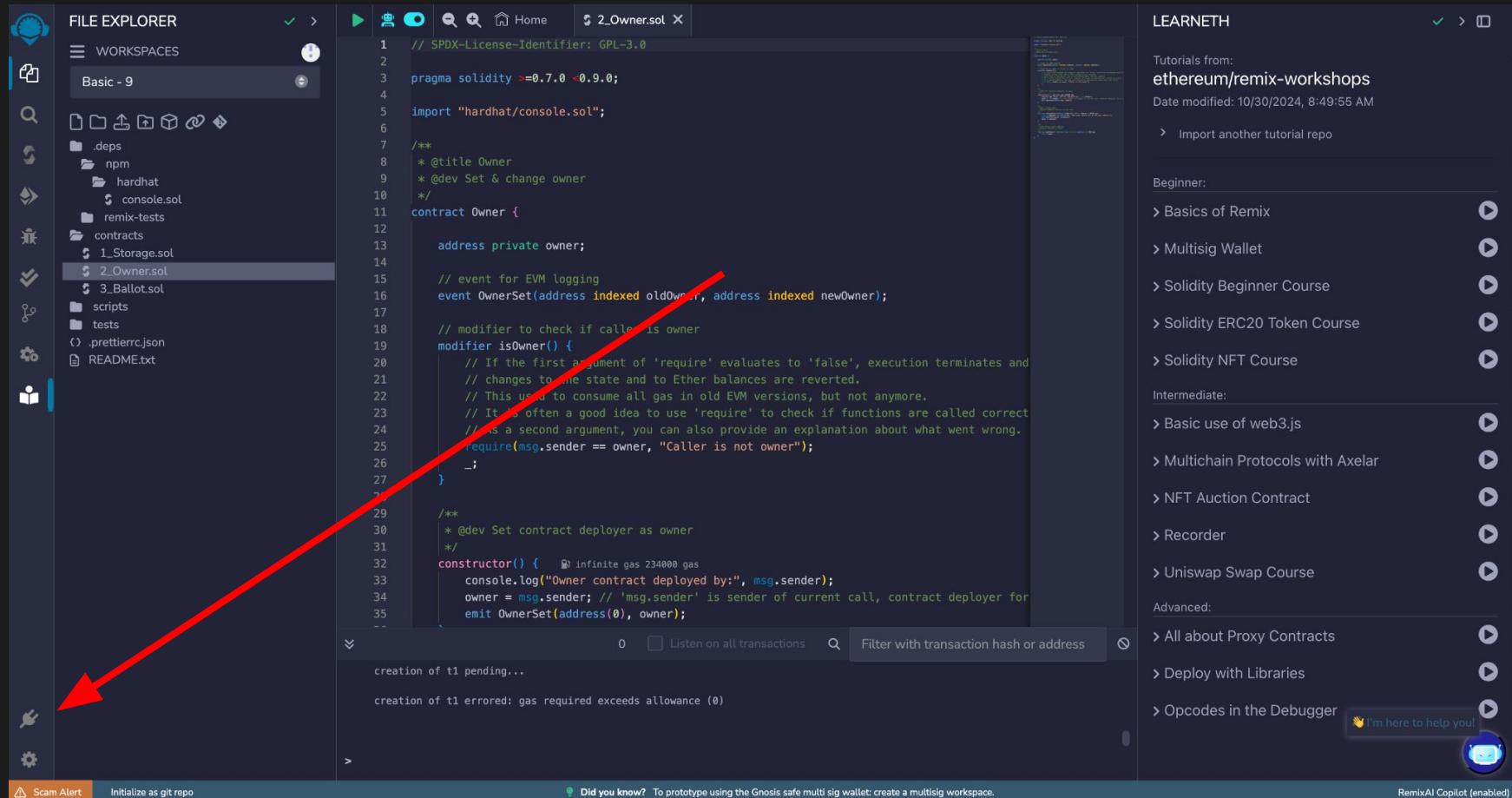
Not like Google Docs! No user accounts on a Remix server

Browser Local Storage → Easy but Feeble

Browser Local Storage & Git → push to Git

Remixd → save to your hard drive

Plugins



FILE EXPLORER

WORKSPACES

Basic - 9

.deps

- npm
- hardhat
- console.sol
- remix-tests
- contracts
- 1_Storage.sol
- 2_Owner.sol
- 3_Ballot.sol
- scripts
- tests
- .prettierrc.json
- README.txt

2_Owner.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.7.0 <0.9.0;
4
5 import "hardhat/console.sol";
6
7 /**
8  * @title Owner
9  * @dev Set & change owner
10 */
11 contract Owner {
12
13     address private owner;
14
15     // event for EVM logging
16     event OwnerSet(address indexed oldOwner, address indexed newOwner);
17
18     // modifier to check if caller is owner
19     modifier isOwner() {
20         // If the first argument of 'require' evaluates to 'false', execution terminates and
21         // changes to the state and to Ether balances are reverted.
22         // This used to consume all gas in old EVM versions, but not anymore.
23         // It's often a good idea to use 'require' to check if functions are called correctly.
24         // If a second argument, you can also provide an explanation about what went wrong.
25         require(msg.sender == owner, "Caller is not owner");
26     }
27 }
28
29 /**
30 * @dev Set contract deployer as owner
31 */
32 constructor() {
33     infinite gas 234000 gas
34     console.log("Owner contract deployed by:", msg.sender);
35     owner = msg.sender; // 'msg.sender' is sender of current call, contract deployer for
36     emit OwnerSet(address(0), owner);
37 }
```

creation of t1 pending...

creation of t1 errored: gas required exceeds allowance (0)

Did you know? To prototype using the Gnosis safe multi sig wallet: create a multisig workspace.

LEARNETH

Tutorials from: [ethereum/remix-workshops](#)

Date modified: 10/30/2024, 8:49:55 AM

Beginner:

- Import another tutorial repo
- Basics of Remix
- Multisig Wallet
- Solidity Beginner Course
- Solidity ERC20 Token Course
- Solidity NFT Course

Intermediate:

- Basic use of web3.js
- Multichain Protocols with Axelar
- NFT Auction Contract
- Recorder
- Uniswap Swap Course

Advanced:

- All about Proxy Contracts
- Deploy with Libraries
- Opcodes in the Debugger

I'm here to help you!

PLUGIN MANAGER

✓ > □

REMIX GUIDE ✓

Activate

Learn Web3 development using Remix with videos.

REMIXD ✓

Activate

Using Remixd daemon, allow to access file system

SENTIO ⓘ

Activate

Search and view function related transactions directly in Remix, service is provided by Sento

SOLIDITY ANALYZERS ✓

Activate

Analyze your code using Remix, Solhint and Slither.

SOLIDITY COMPILER (XINGHUO BIF) ⓘ

Activate

Compile Solidity Contracts (Xinghuo BIF)

STARKNET ⓘ

Activate

Compile and deploy contracts with Cairo, a native smart contract language for Starknet.

TENDERLY ⓘ

Activate

Remix & Tenderly Project Integration. Verify Contracts. Import To Remix From your Tenderly project.

VYPER COMPILER ✓

Activate

Compile vyper contracts

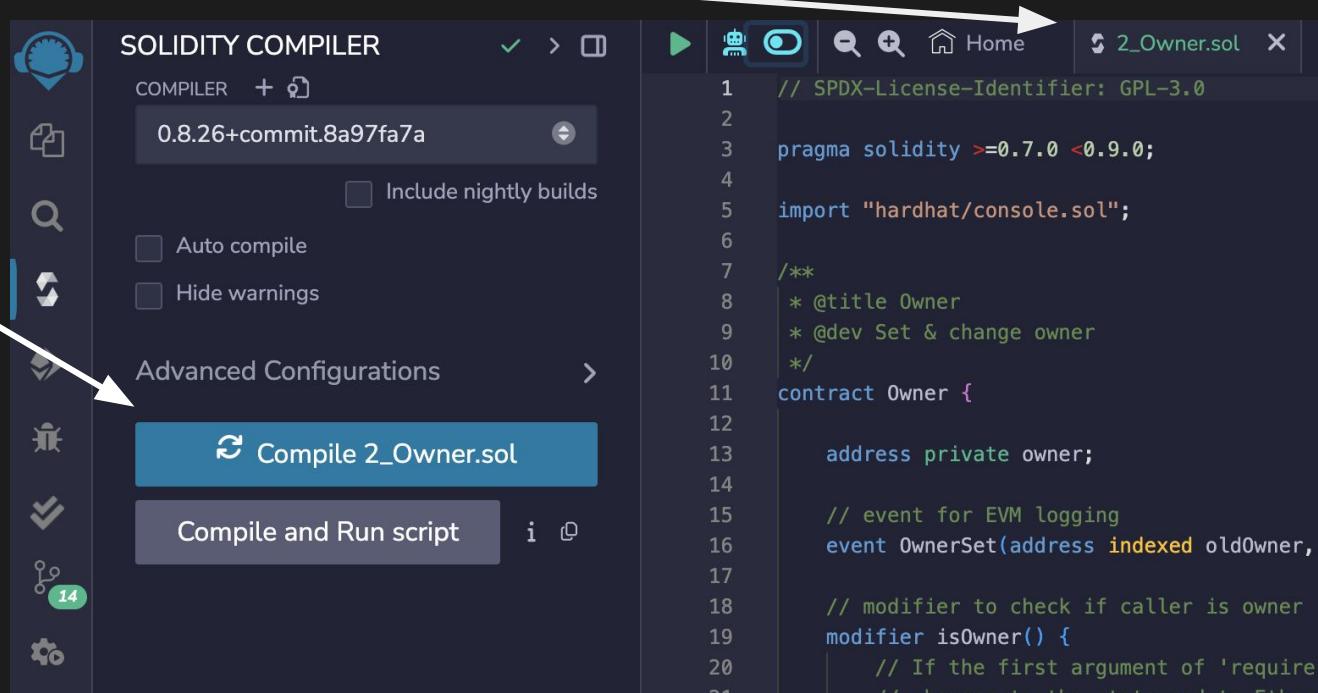
Permissions



Compiling

Solidity Compiler plugin

A .sol file is active in the editor



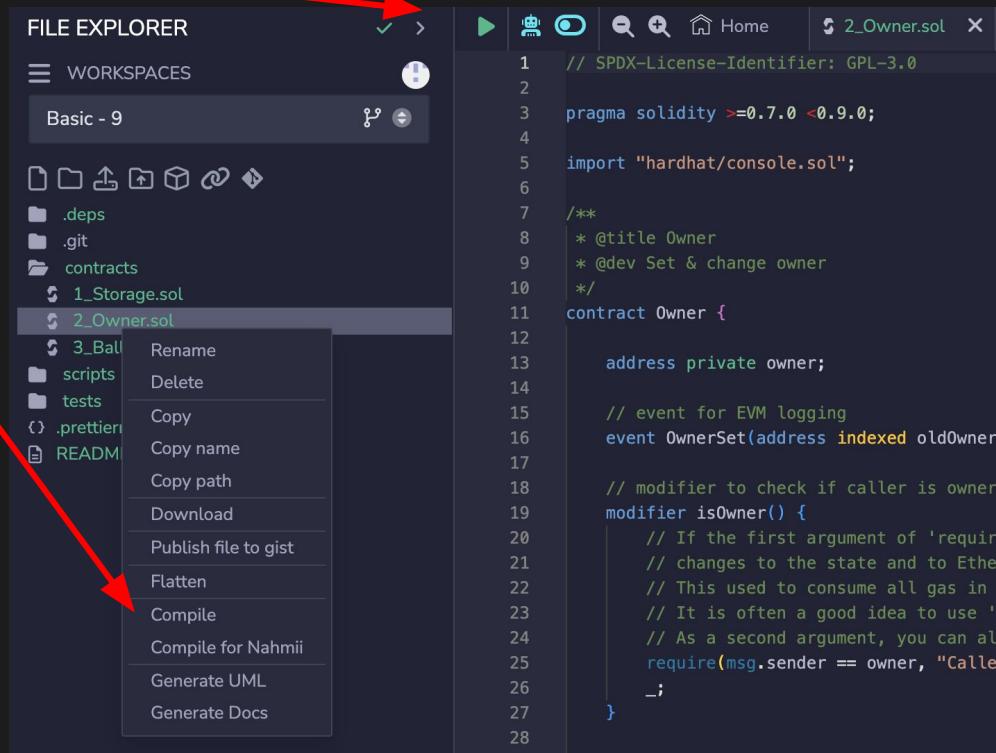
The screenshot shows the Solidity Compiler plugin interface within an IDE. The status bar at the top right indicates that '2_Owner.sol' is the active file. The main area is the 'SOLIDITY COMPILER' interface, which includes a version dropdown set to '0.8.26+commit.8a97fa7a', several checkboxes for settings like 'Include nightly builds', 'Auto compile', and 'Hide warnings', and a 'Advanced Configurations' dropdown. A prominent blue button at the bottom is labeled 'Compile 2_Owner.sol'. To the right of the compiler interface is a code editor window showing a Solidity contract named '2_Owner.sol'. The code includes SPDX license information, pragma solidity version, imports, and a contract definition named 'Owner' with various functions and events.

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.7.0 <0.9.0;
import "hardhat/console.sol";
/**
 * @title Owner
 * @dev Set & change owner
 */
contract Owner {
    address private owner;
    // event for EVM logging
    event OwnerSet(address indexed oldOwner,
    // modifier to check if caller is owner
    modifier isOwner() {
        // If the first argument of 'require'
        // is true, then the state variable
        // 'owner' is updated to the caller's
        // address
        if (msg.sender != owner) {
            owner = msg.sender;
            console.log("Owner set to: ", owner);
        }
    }
}
```

Click the compile button

Compiling shortcuts

Click the play button

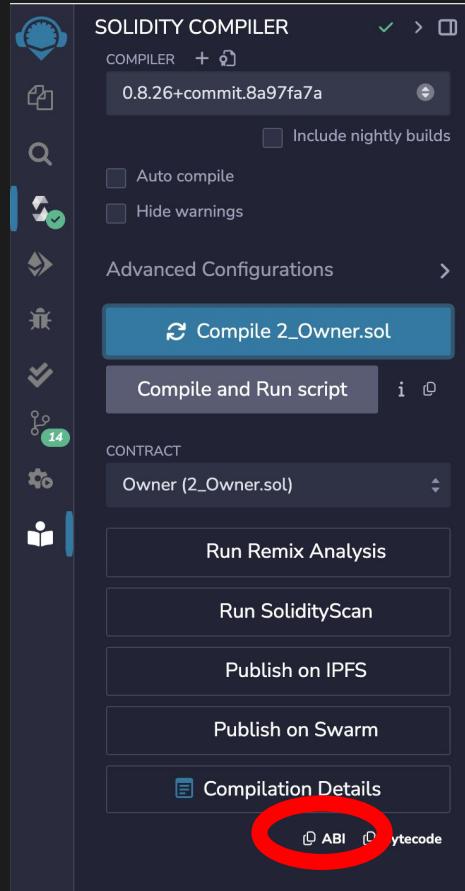


```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.7.0 <0.9.0;
import "hardhat/console.sol";
/**
 * @title Owner
 * @dev Set & change owner
 */
contract Owner {
    address private owner;
    // event for EVM logging
    event OwnerSet(address indexed oldOwner,
    // modifier to check if caller is owner
    modifier isOwner() {
        // If the first argument of 'require'
        // changes to the state and to Ether
        // This used to consume all gas in o
        // It is often a good idea to use 're
        // As a second argument, you can also
        require(msg.sender == owner, "Caller
    }
}
```

Select compile in the right click popup menu

CTRL + S

Get the ABI of your contract



The screenshot shows the Truffle UI interface. On the left is a sidebar with various icons: headphones (active), a file, a magnifying glass, a green checkmark, a diamond, a person, a checkmark, a gear (with a '14' notification), and a person icon. The main area is titled "SOLIDITY COMPILER" and shows the compiler version "0.8.26+commit.8a97fa7a". There are checkboxes for "Include nightly builds", "Auto compile", and "Hide warnings". A "Advanced Configurations" dropdown is open, showing a "Compile 2_Owner.sol" button (which is highlighted in blue), a "Compile and Run script" button, and an "Owner (2_Owner.sol)" dropdown. Below these are buttons for "Run Remix Analysis", "Run SolidityScan", "Publish on IPFS", "Publish on Swarm", and "Compilation Details". The "Compilation Details" button is circled in red at the bottom.

Deploying

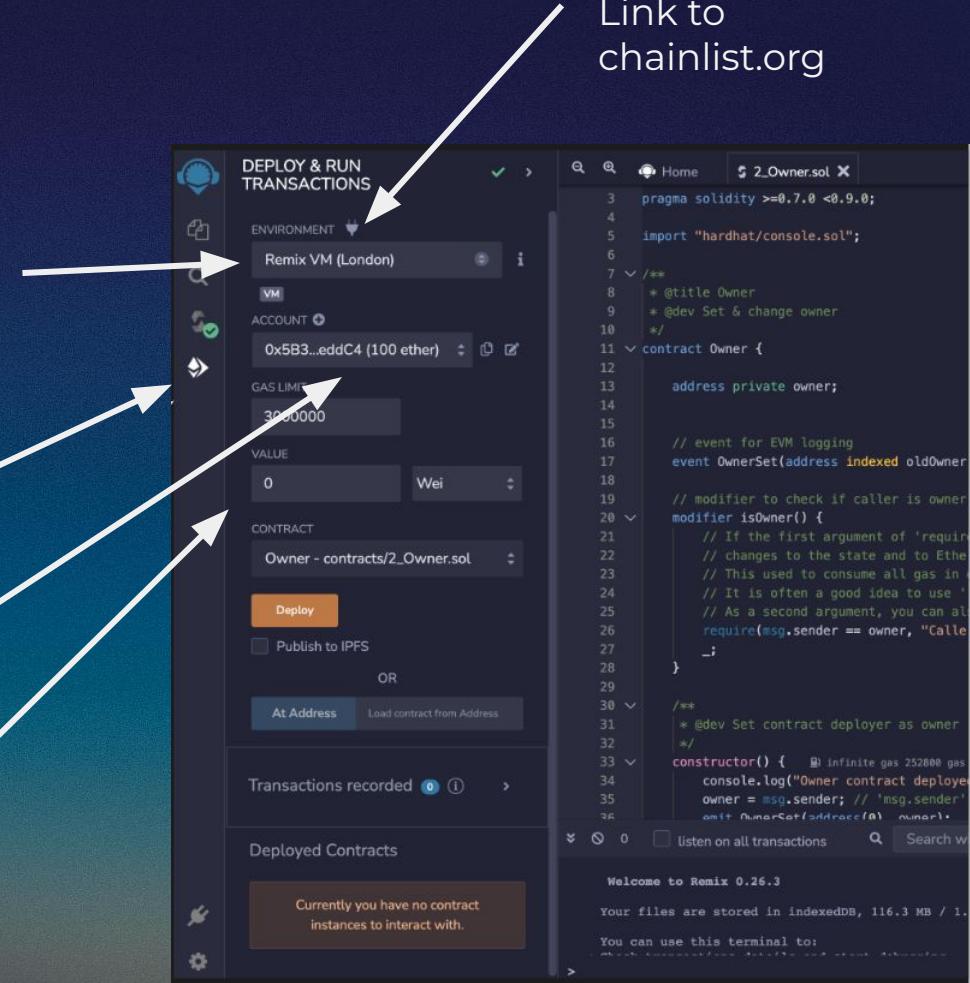
Deploying Intro

Choose your chain (the default is the in-browser chain - Remix VM)

Deploy & Run icon

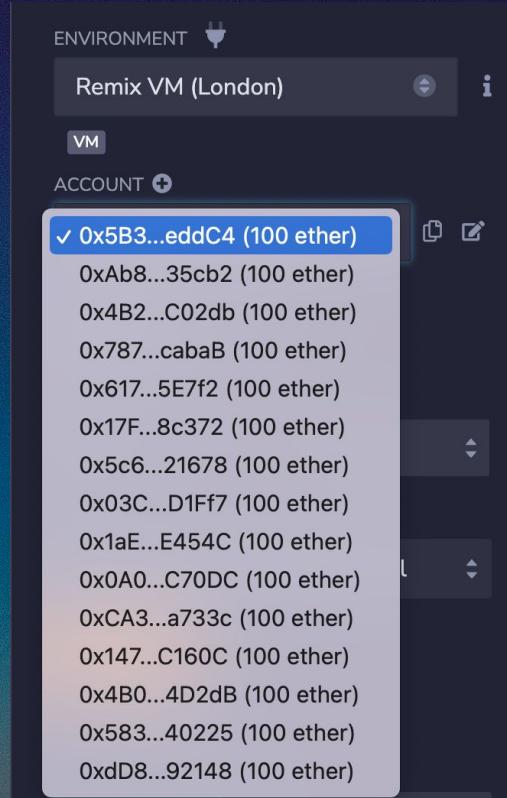
Account selector

Add ETH (or Wei, etc) to a payable function



Remix VM Chain

- No approving needed to make a txn go through.
- 10 accounts with 100 ether
- Nothing persists after the browser refreshes
- Is not public - so no MetaMask needed
- It's simple and fast



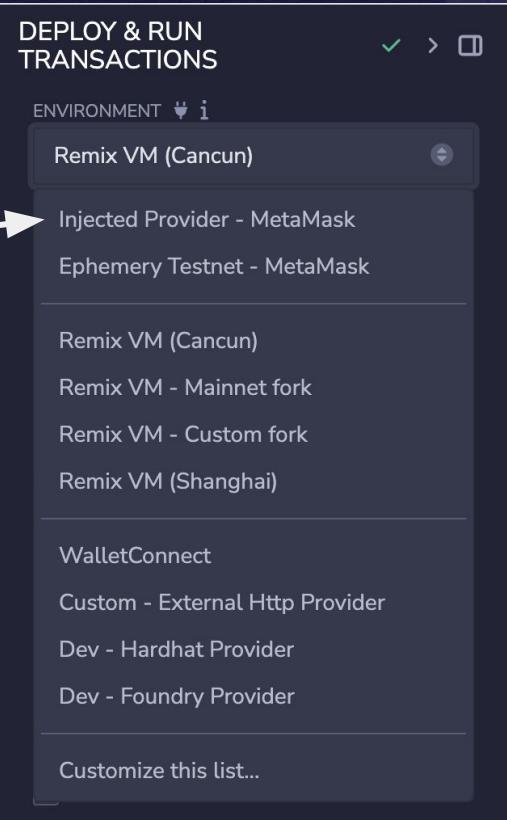
Environment Choices

For using a Browser Wallet (e.g. MetaMask)
to connect to public networks

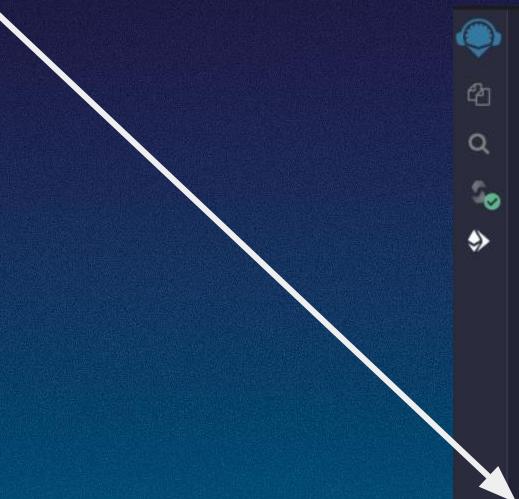
For approving txns on a mobile device

For connecting to these local nodes
(you need to have one of them running)

Check here



Click deploy



DEPLOY & RUN TRANSACTIONS

ENVIRONMENT: Remix VM (London)

ACCOUNT: 0x5B3...eddC4 (100 ether)

GAS LIMIT: 3000000

VALUE: 0 Wei

CONTRACT: Owner - contracts/2_Owner.sol

Deploy

Publish to IPFS

OR

At Address Load contract from Address

Transactions recorded 0

Deployed Contracts

Currently you have no contract instances to interact with.

Welcome to Remix 0.26.3

Your files are stored in indexedDB, 116.3 MB / 1.

You can use this terminal to:

```
pragma solidity >=0.7.0 <0.9.0;
import "hardhat/console.sol";
/*
 * @title Owner
 * @dev Set & change owner
 */
contract Owner {
    address private owner;

    // event for EVM logging
    event OwnerSet(address indexed oldOwner, address indexed newOwner);

    // modifier to check if caller is owner
    modifier isOwner() {
        // If the first argument of 'require' changes to the state and to Ether
        // This used to consume all gas in the previous version of the modifier
        // It is often a good idea to use 'msg.sender' as the argument
        require(msg.sender == owner, "Caller is not owner");
    }

    /**
     * @dev Set contract deployer as owner
     */
    constructor() {
        infinite gas 252800 gas
        console.log("Owner contract deployed");
        owner = msg.sender; // 'msg.sender' emits OwnerSet(address(0), owner);
    }
}
```

If successful... the deployed instance

Txn successful in the terminal

Deployed Instance appears in the Deployed Contracts section

The diagram illustrates the workflow for deploying a smart contract. It shows three main components: a terminal window, a Remix interface, and a Deployed Contracts section.

Terminal Window: Shows the text "Txn successful in the terminal".

Remix Interface: Shows the "DEPLOY & RUN TRANSACTIONS" interface. The "ENVIRONMENT" dropdown is set to "Remix VM (London)". The "ACCOUNT" dropdown shows the address "0x5B3...eddC4 (99.9999999)". The "GAS LIMIT" is set to "3000000". The "CONTRACT" dropdown shows "Owner - contracts/2_Owner.sol". A large orange "Deploy" button is visible. Below the interface, the terminal output shows the transaction details: "hash: 0x70f...fc058" and "Owner contract deployed by: 0x5B38Da6a701c568545dCfcB03FcB875f56beddC4".

Deployed Contracts Section: Shows the "Deployed Contracts" section with the text "OWNER AT 0xD91...3913B (MEMORY)".

Code Editor: Shows the Solidity code for the "2_Owner.sol" contract. The code defines a private owner address and includes a modifier "isOwner" to check if the caller is the owner. It also includes an event "OwnerSet" for EVM logging.

Interacting with a contract's function

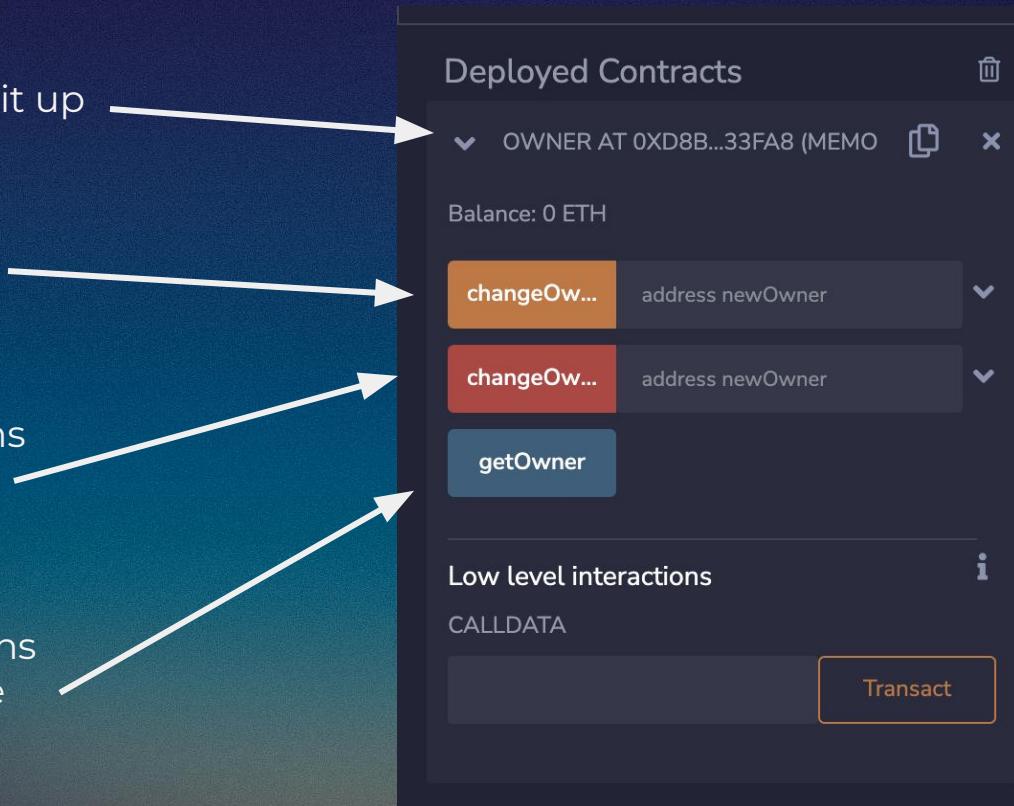
Open the instance to see the functions

Clicking on the caret opens it up

Orange buttons are for functions that write to the chain (and have gas fees).

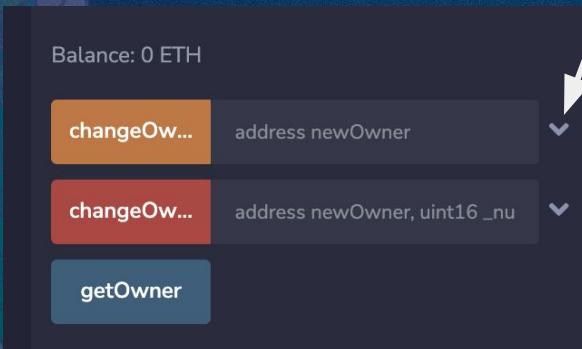
Red buttons are for functions where you can send ETH or GWEI etc.

Blue buttons are for functions that just lookup info so have no gas fees.

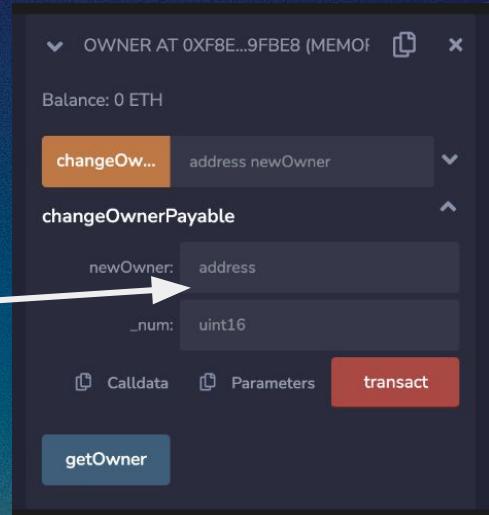


Open up a function to see the inputs individually

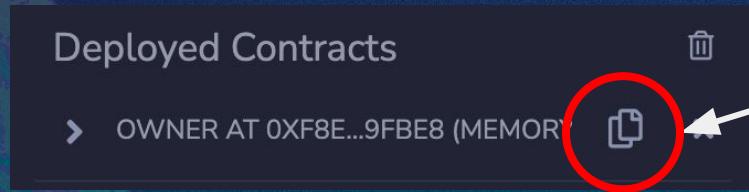
Clicking on the caret opens it up



The function
changeOwnerPayable has 2
inputs. See their type



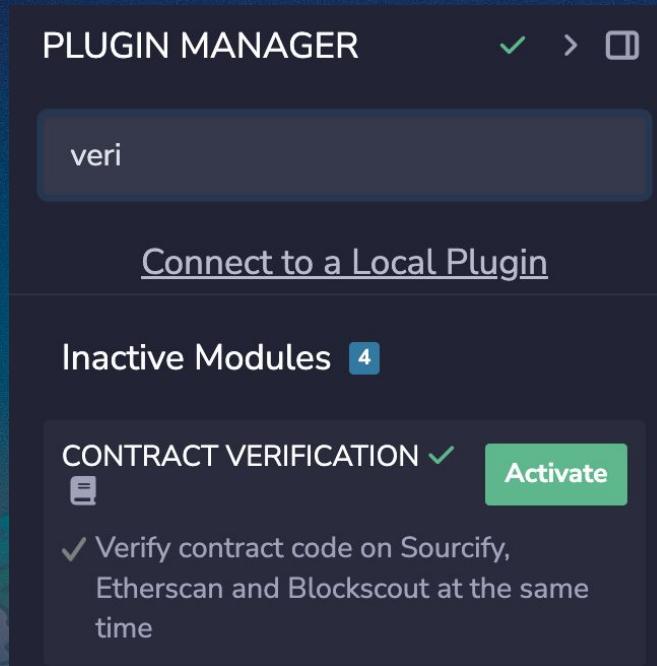
Getting the address of a contract you just deployed



Click here to copy the address

Verification Plugin

→ Just released today - verify on 3 services at once



Verification Plugin

PLUGIN MANAGER ✓ > □

veri

Connect to a Local Plugin

Inactive Modules 4

CONTRACT VERIFICATION ✓ Activate

✓ Verify contract code on Sourcify, Etherscan and Blockscout at the same time

CONTRACT VERIFICATION ✓ > □

Verify Receipts Lookup Settings

Verify compiled contracts on different verification services

Chain Select a chain

Contract Address 0x2738d13E81e...

Contract Name Compiled contract required

The deployed contract is behind a proxy

Verify on:

Sourcify

Etherscan

Blockscout

Verify

Verification Plugin

CONTRACT VERIFICATION ✓ > ⚙️

Verify Receipts Lookup Settings

Verify compiled contracts on different verification services

Chain

sepol

Ethereum Testnet Sepolia (11155111)

Linea Sepolia Testnet (59141)

Nanon Sepolia Rollup Testnet (27483)

Karak Testnet Sepolia (8054)

Kroma Testnet Sepolia (2358)

Sepolia PGN (Public Goods)

CONTRACT VERIFICATION ✓ > ⚙️

Verify Receipts Lookup Settings

Check the verification statuses of contracts submitted for verification

▼ OWNER AT 0X48E...2818F

Chain: Sepolia (11155111)
File: contracts/2_Owner.sol
Submitted at: 10/22/2024, 10:15:00 PM
Verified at:

Sourcify ✓ ↗

Etherscan ✓ ↗

Blockscout ✓ ↗

CONTRACT VERIFICATION ✓ > ⚙️

Verify Receipts Lookup Settings

Customize settings for each verification service and chain

Chain

Ethereum Testnet Sepolia (11155111)

Sourcify - Sepolia

API URL
<https://sourcify.dev/server>

Repo URL
<https://repo.sourcify.dev>

Etherscan - Sepolia

API Key
Add API Key

API URL
<https://api-sepolia.etherscan.io>

Explorer URL
<https://sepolia.etherscan.io>

Blockscout - Sepolia

Learning:
RemixAI
LearnEth tutorials
Remix Guide Videos
Showing someone some code

RemixAI

- Code Explanations
- Coding Assistance on request
- Coding Completion while you type

AI in Remix

- Code Explanations initiated from:
 - ◆ **The Robot Icon**
 - ◆ Compiler Errors
 - ◆ Right clicking on some code

SOLIDITY COMPILER

✓ > □



Home

2_Owner.sol X

COMPILER + ⚙

0.8.26+commit.8a97fa7a

 Include nightly builds Auto compile Hide warnings

Advanced Configurations >

⟳ Compile 2_Owner.sol

Compile and Run script i ⚙

CONTRACT

Owner (2_Owner.sol) ▾

📈 Run Remix Analysis

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.7.0 <0.9.0;
4
5 import "hardhat/console.sol";
6
7 /**
8  * @title Owner
9  * @dev Set & change owner
10 */
11 contract Owner {
12
13     address private owner;
14
15     // event for EVM logging
16     event OwnerSet(address indexed oldOwner, address indexed
17
18     // modifier to check if caller is owner
19     modifier isOwner() {
20
21         // If the first argument of 'require' evaluates to
22         // changes to the state and to Ether balances are
23         // This used to consume all gas in old EVM version
24         // It is often a good idea to use 'require' to che
```

The image shows the Solidity Compiler interface within a Remix browser window. The sidebar on the left contains various icons for developer tools like compiler, search, and deployment. The main area shows a Solidity code editor with the file '2_Owner.sol' open. The code defines a simple smart contract named 'Owner' that manages ownership. A RemixAI analysis is displayed below the code, explaining the contract's functionality and the meaning of its various components.

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.7.0 <0.9.0;

import "hardhat/console.sol";

/**
 * @title Owner
 * @dev Set & change owner
 */
contract Owner {
    address private owner;
}
```

Waiting for RemixAI answer...

This Solidity code is a simple smart contract for managing ownership. Here's an explanation:

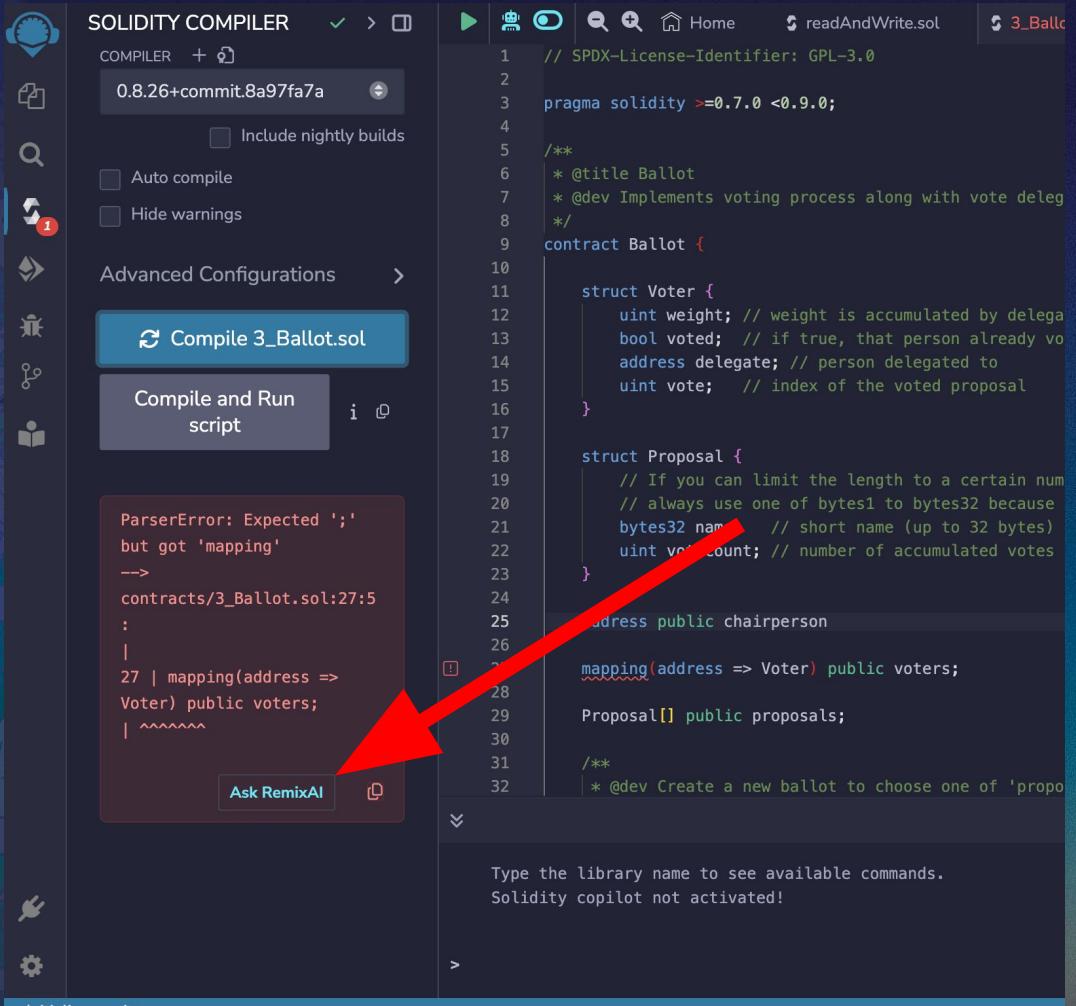
- `// SPDX-License-Identifier: GPL-3.0` : This line indicates the license of this contract, which is GNU General Public License v3.0.
- `pragma solidity 0.7.0 < 0.9.0;` : This line sets the version of Solidity compiler this code should be compiled with. In this case, it's compiled to less than 0.9.0.
- `import "hardhat/console.sol";` : This imports the Hardhat console for logging in the contract.
- The contract is named `Owner` and has a single state variable, `owner` which stores the address of the owner of this contract.
- An event `OwnerSet` is emitted every time the owner changes with the old and new owner addresses as arguments.
- There's a modifier `isOwner` that checks if the sender of the current function call (`msg.sender`) is the owner of this contract, and revert if not.

The contract has three public functions:

1. The constructor sets the deployer of the contract as the initial owner and emits an `OwnerSet` event with the old owner address set to zero (0x00) and new owner as the sender.
2. The function `changeOwner(address newOwner) public isOwner` changes the owner to a new address provided by the caller, if they are the current owner. It emits an `OwnerSet` event with old owner and new owner addresses.
3. The external view function `getOwner() external view returns (address)` simply returns the current owner's address. This function does not only reads data from the contract.

RemixAI

- Explanations initiated from:
 - ◆ The Robot Icon
 - ◆ **Compiler Errors**
 - ◆ Right clicking on some code



The screenshot shows the Remix IDE interface with the Solidity Compiler tab selected. The code editor displays a Solidity contract named `3_Ballot.sol`. A red arrow points from the `Ask RemixAI` button in the bottom-left corner of the error message box to the `mapping` keyword in the error message, highlighting a specific error in the code.

SOLIDITY COMPILER

COMPILER + 

0.8.26+commit.8a97fa7a 

Include nightly builds

Auto compile

Hide warnings

Advanced Configurations >

 **Compile 3_Ballot.sol**

 **Compile and Run script**

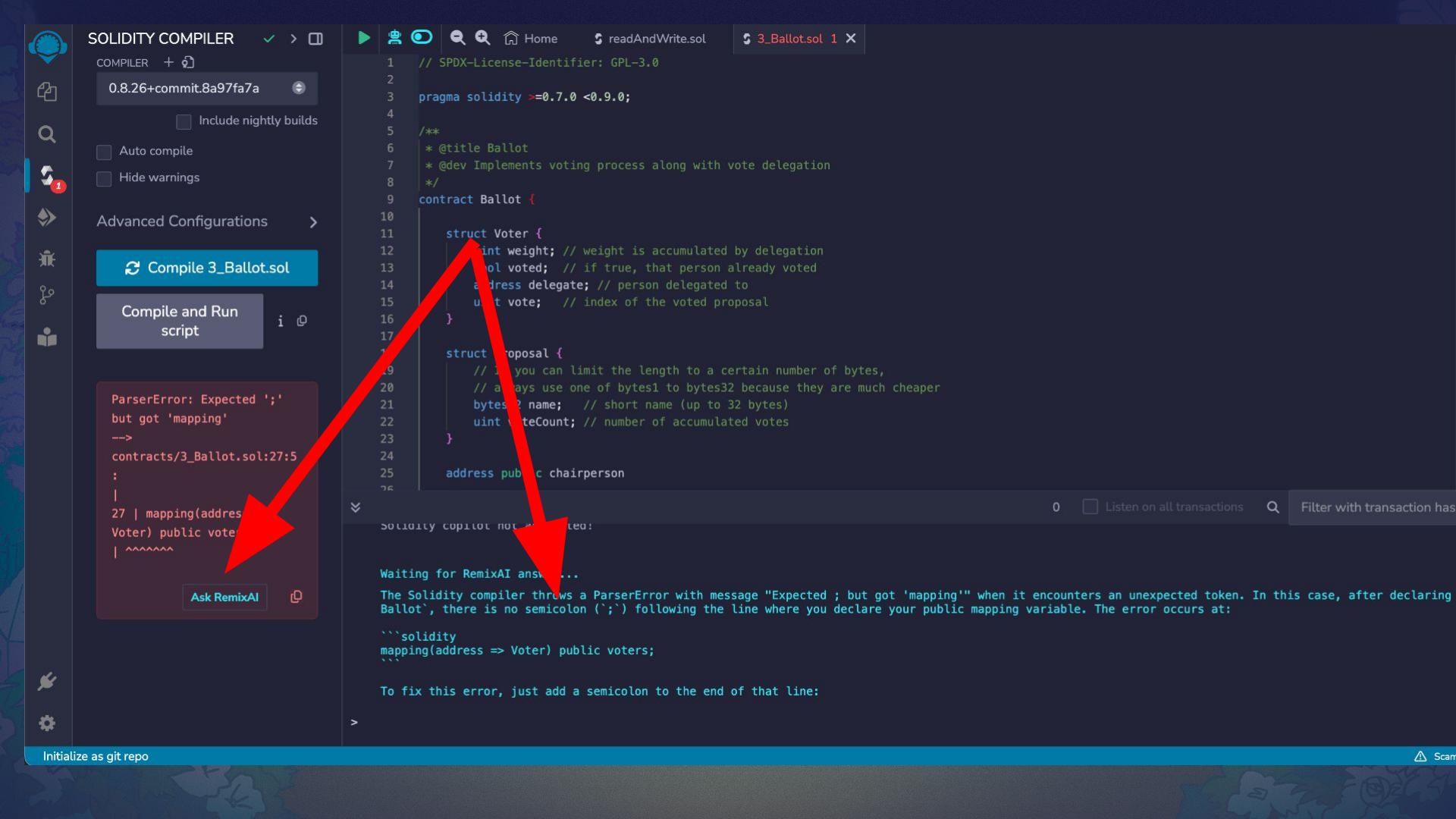
**ParserError: Expected ';' but got 'mapping'**
--->
contracts/3_Ballot.sol:27:5
:
|
27 | mapping(address =>
Voter) public voters;
| ^~~~~~

Ask RemixAI 

1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.7.0 <0.9.0;
4
5 */**
6 * @title Ballot
7 * @dev Implements voting process along with vote deleg
8 *
9 contract Ballot {
10
11 struct Voter {
12 uint weight; // weight is accumulated by delega
13 bool voted; // if true, that person already vo
14 address delegate; // person delegated to
15 uint vote; // index of the voted proposal
16 }
17
18 struct Proposal {
19 // If you can limit the length to a certain num
20 // always use one of bytes1 to bytes32 because
21 bytes32 name; // short name (up to 32 bytes)
22 uint voteCount; // number of accumulated votes
23 }
24
25 address public chairperson;
26
27 mapping(address =>
Voter) public voters;
28
29 Proposal[] public proposals;
30
31 */**
32 * @dev Create a new ballot to choose one of 'propo

Type the library name to see available commands.
Solidity copilot not activated!

Initialize as git repo



SOLIDITY COMPILER

COMPILER + 0.8.26+commit.8a97fa7a

Include nightly builds

Auto compile

Hide warnings

Advanced Configurations

Compile 3_Ballot.sol

Compile and Run script

ParserError: Expected ';' but got 'mapping'

contracts/3_Ballot.sol:27:5

27 | mapping(address Voter) public vote

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.7.0 <0.9.0;

/**
 * @title Ballot
 * @dev Implements voting process along with vote delegation
 */
contract Ballot {

    struct Voter {
        int weight; // weight is accumulated by delegation
        bool voted; // if true, that person already voted
        address delegate; // person delegated to
        uint vote; // index of the voted proposal
    }

    struct Proposal {
        // If you can limit the length to a certain number of bytes,
        // always use one of bytes1 to bytes32 because they are much cheaper
        bytes32 name; // short name (up to 32 bytes)
        uint voteCount; // number of accumulated votes
    }

    address public chairperson
```

Waiting for RemixAI answer...

The Solidity compiler throws a ParserError with message "Expected ; but got 'mapping'" when it encounters an unexpected token. In this case, after declaring Ballot, there is no semicolon (`;`) following the line where you declare your public mapping variable. The error occurs at:

```
```solidity
mapping(address => Voter) public voters;
```

To fix this error, just add a semicolon to the end of that line:

Initialize as git repo

Scan

# RemixAI

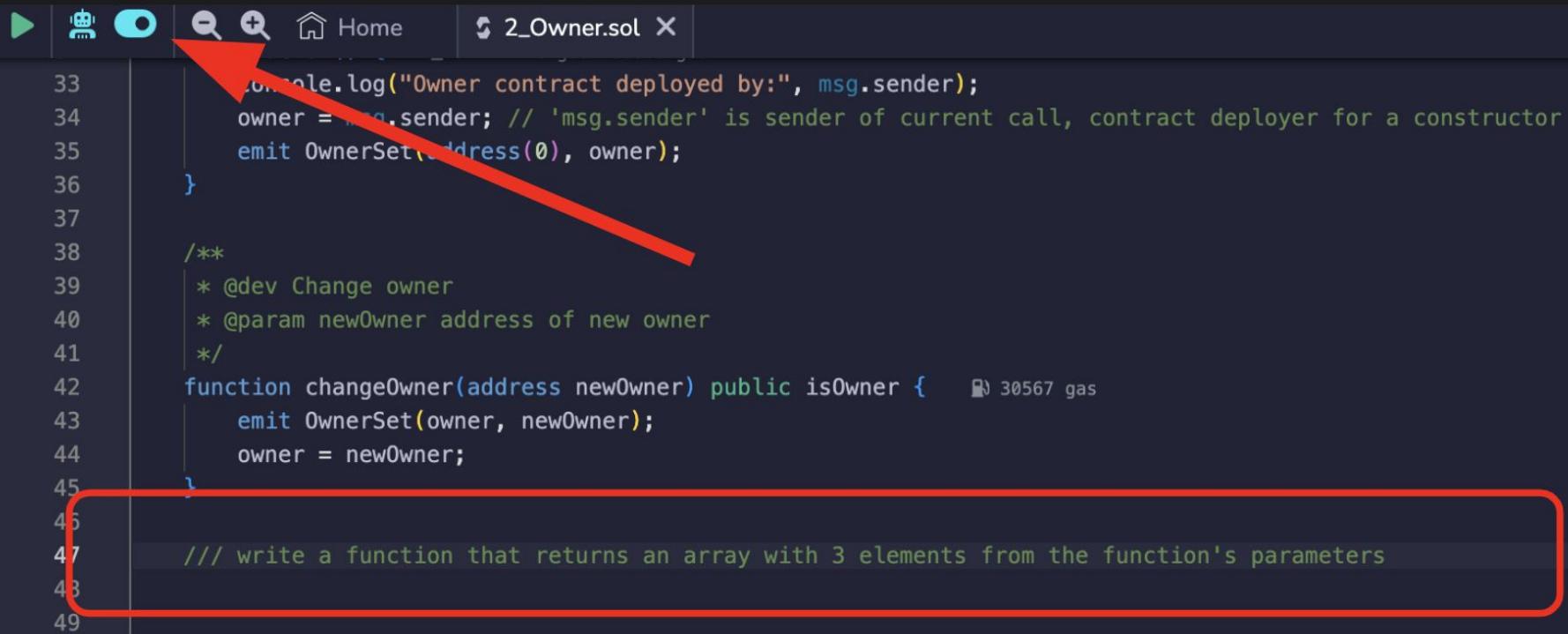
- Explanations initiated from:
  - ◆ The Robot Icon
  - ◆ Compiler Errors
  - ◆ **Right clicking on some code**

```
1 // If you can limit the length to a certain number of bytes,
2 // always use one of bytes1 to bytes32 because they are much cheaper
3 bytes32 name; // short name (up to 32 bytes)
4 uint voteCount; // number of accumulated votes
5 }
6
7 address public chairperson;
8
9 mapping(address => Voter) public voters;
10
11 Proposal[] public proposals;
12
13 /**
14 * @dev Create a
15 * @param propos
16 */
17 constructor(bytes32
18 chairperson
19 voters[chairperson]
20 proposals
21 for (uint i
22 // 'Propose'
23 // Propose
24 // append
25 proposal
26 name
27 voter
28 }));
29
30 }
31
32 /**
33 * @dev Give 'vo
34 * @param voter
35 */
36 function giveRig
37 require(
38 msg.sender == chairperson,
39 "Only chairperson can give right to vote."
40);
41
42 require(
43 voters[voter].right
44 "Voter does not have the right to vote."
45);
46
47 voters[voter].right = true;
48
49 }
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```

# RemixAI

- Coding Assistance on request
  - ◆ Ask with ///
  - ◆ Code suggestions while you type

# Code assistance with ///



```
33 console.log("Owner contract deployed by:", msg.sender);
34 owner = msg.sender; // 'msg.sender' is sender of current call, contract deployer for a constructor
35 emit OwnerSet(address(0), owner);
36 }
37
38 /**
39 * @dev Change owner
40 * @param newOwner address of new owner
41 */
42 function changeOwner(address newOwner) public isOwner { 30567 gas
43 emit OwnerSet(owner, newOwner);
44 owner = newOwner;
45
46
47 /// write a function that returns an array with 3 elements from the function's parameters
48
49 }
```

```
/// write a function that returns an array with 3 elements from the function's parameters
```

# RemixAI Copilot tries new answers on each request

```
/* @dev Returns an array with three elements */
function returnArray(uint256 a, uint256 b, uint256 c) public view returns (uint256[] memory){
 uint256[] memory arr = new uint256[](3); // allocating array in memory
 arr[0]=a;
 arr[1]=b;
 arr[2]=c;

 return arr;
}

/**/


```
/// write a function that returns an array with 3 elements from the function's parameters
/*
 * @dev Returns an array of three elements from function parameter.
 * @param element1 First element to return in the array.
 * @param element2 Second element to return in the array.
 * @param element3 Third element to return in the array.
 */
function createArray(uint256 element1, uint256 element2, uint256 element3) public view returns (uint256[])
{
    uint256[] memory myArray = new uint256[](3);
    myArray[0] = element1;
    myArray[1] = element2;
    myArray[2] = element3;
    return myArray;
}
```


```

```
/// write a function that returns an array with 3 elements from the function's parameters
```

```
/* @dev returns an array with three elements */
function returnArrayFunction (uint x , uint y , uint z) public pure returns (uint[3] memory){
 return [x,y,z];
}
```

# Code Completion

1 line suggested at a time. Hit tab to accept.

```
modifier onlyOwner() {
```

```
modifier isNotOwner() { require(msg.sender != owner, "Caller is owner");
```

```
modifier isNotOwner() { require(msg.sender != owner, "Caller is already owner");
| _;
}
```

# LearnEth tutorials

The image shows a composite screenshot of the Remix IDE and the LearnETH website. The Remix IDE on the left displays a Solidity contract named `2_Owner.sol`. The code defines a `Owner` contract with a private owner variable and a modifier `isOwner` that checks if the caller is the owner. It also includes a constructor that sets the owner to the deployer and emits an `OwnerSet` event. The Remix interface includes sections for Deploy & Run Transactions, Environment (Remix VM, Cancun), Account (0x5B3...), Gas Limit (3000000), Value (0 Wei), and a Deploy button. The LearnETH website on the right lists various Ethereum workshops and tutorials, such as Basics of Remix, Multisig Wallet, Solidity Beginner Course, and Solidity ERC20 Token Course. A red arrow points from the LearnETH sidebar to the `Basics of Remix` section.

Scam Alert main

Did you know? To prototype using the Gnosis safe multi sig wallet, create a multisig workspace.

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT i

Remix VM (Cancun)

VM

ACCOUNT 0x5B3...eddC4 (100 ether)

GAS LIMIT

Estimated Gas

Custom 3000000

VALUE

0 Wei

CONTRACT

Owner - contracts/2\_Owner.sol

evm version: cancan

Deploy

Publish to IPFS

At Address Load contract from Address

Transactions recorded 0 i

Deployed Contracts 0

creation of t1 errored: gas required exceeds allowance (0)

Cloning <https://github.com/sammang/solidity-examples.git...> please wait...

Home 2\_Owner.sol X

// SPDX-License-Identifier: GPL-3.0

pragma solidity >=0.7.0 <0.9.0;

import "hardhat/console.sol";

/\*\*

\* @title Owner

\* @dev Set & change owner

\*/

contract Owner {

address private owner;

// event for EVM logging

event OwnerSet(address indexed oldOwner, address indexed newOwner);

// modifier to check if caller is owner

modifier isOwner() {

// If the first argument of 'require' evaluates to 'false', execution terminates as if

// changes to the state and to Ether balances are reverted.

// This used to consume all gas in old EVM versions, but not anymore.

// It is often a good idea to use 'require' to check if functions are called correctly.

// As a second argument, you can also provide an explanation about what went wrong.

require(msg.sender == owner, "Caller is not owner");

}

/\*\*

\* @dev Set contract deployer as owner

\*/

constructor() {

infinite gas 234000 gas

console.log("Owner contract deployed by:", msg.sender);

owner = msg.sender; // 'msg.sender' is sender of current call, contract deployer for

emit OwnerSet(address(0), owner);

;

}

0  Listen on all transactions Filter with transaction hash or address

LEARNETH

Tutorials from: [ethereum/remix-workshops](https://ethereum/remix-workshops)

Date modified: 10/30/2024, 8:49:55 AM

Import another tutorial repo

Beginner:

Basics of Remix

Multisig Wallet

Solidity Beginner Course

Solidity ERC20 Token Course

Solidity NFT Course

Intermediate:

Basic use of web3.js

Multichain Protocols with Axelar

NFT Auction Contract

Recorder

Uniswap Swap Course

Advanced:

All about Proxy Contracts

Deploy with Libraries

Opcodes in the Debugger

I'm here to help you!

# Remix Guide

Home X 2\_Owner.sol

# REMIX



The Native IDE for Web3 Development.

Website [Remix Desktop](#)

Search Documentation  

Explore. Prototype. Create.

[Start Coding](#) [ZK Semaphore](#) [ERC20](#)

[Uniswap V4 Hooks](#) [NFT / ERC721](#) [MultiSig](#)

Recent Workspaces

[blank - 2](#)  
[blank - 1](#)  
[Basic - 9](#)

Files

[New](#) [Open](#) [Gist](#) [Clone](#)

[Connect to Local Filesystem](#)

## Featured



WATCH TO LEARN

Video Tips from the Remix Team

Remix has a growing library of videos containing lots of tips for using the tool. Check them out and subscribe to get our latest uploads.

[Watch](#)

## Featured Plugins

 **SOLIDITY ANALYZERS**  
Analyze your code using Remix, Solhint and Slither.

 **LEARNETH TUTORIALS**  
Learn about Remix, Solidity, and other Web3 projects.

 **COOKBOOK**  
Find smart contracts, solidity libraries, and discover protocols.

 **SOLIDITY**  
Compile, test, and an smart contracts.

# Remix Guide

PLUGIN MANAGER

guide

[Connect to a Local Plugin](#)

Inactive Modules 1

REMIX GUIDE ⓘ

Learn remix with videos

Activate

Remix Guide

Streamlined access to categorized video tutorials for mastering Remix IDE. From fundamentals to advanced techniques, level up your development skills with ease.

Filter the list

Remix Beginner Advanced AI Plugins Solidity EVM no tag

### Remix Basics

- INTRO TO REMIX
- WORKSPACES
- REMIXD
- VERIFYING W/ ETHERSCAN
- ESSENTIAL FEATURES
- REMIX W/ HARDHAT

### Solidity Basics

- HELLO WORLD
- EVENTS
- FUNCTIONS
- PAYABLE FUNCTIONS
- STATE VARIABLES
- GAS & GAS PRICE

### Remix Techniques

- PROXY CONTRACTS
- COMPILE & RUN
- SCRIPTS
- TXN RECORDER
- SOLIDITY STATIC ANALYZERS
- ETH DOC GENERATOR

### Low Level Solidity Videos

- EVM STORAGE
- TRANSIENT STORAGE
- BIT MASKING
- STRUCTS IN STORAGE
- ARRAYS IN STORAGE

EVM Storage Yul SSTORE SLOAD

Transient Storage

EVM Storage Bit Masking

EVM Storage Structs

EVM Storage Fixed Size Array

# Getting help from a person

# Making a GIST

or

## Getting help / Showing code via a URL



## FILE EXPLORER

✓ >

▶ 🔎 ⌂ Home 2\_Owner.sol X

WORKSPACES +

remixDefault\_1670255646006



▼ ⌂ ⌂ ⌂ ⌂

contracts

- art New File
- 1\_ New Folder
- 2\_ Rename
- 3\_ Delete
- script
- test Backup
- .gith Publish folder to gist
- .dep Copy
- com Set path for Unit Testing
- REA



```
1 // SPDX-License-Identifier: GPL-3
2
3 pragma solidity >=0.7.0 <0.9.0;
4
5 import "hardhat/console.sol";
6
7 /**
8 * @title Owner
9 * @dev Set & change owner
10 */
11 contract Owner {
12
13 address private owner;
14
15 // event for EVM logging
16 event OwnerSet(address indexed
17
18 // modification to check if call
19
20
21 // changes to the state are
22 // This used to consume a
23 // It is often a good idea
24 // As a second argument, !
```

contracts/2\_Owner.sol 18:23

```
R ✓ > ▶ 🔍 Home MyToken.sol X
+ ⚙
adeable_1668112192029
fb3a0d049aa1b1fb47adc68a.json
metadata.json
on

_ethers.ts
_web3.ts

ig.json
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Gist is ready
The gist is at https://gist.github.com/76681b63eaa46ae87eaedbce40dbdbd7.
Would you like to open it in a new window?
OK Cancel
table.sol";
sol";
sol";
e.sol";
le, UUPSUpgradeable {
constructor() { infinite gas 3027400 gas
 _disableInitializers();
}

function initialize() initializer public { infinite gas
 __ERC721_init("MyToken", "MTK");
 __Ownable_init();
 __UUPSUpgradeable_init();
}

function _authorizeUpgrade(address newImplementation) infinite gas
 internal
 onlyOwner
 override
 {}
}
27
```



# Thanks!!

Rob Stupay  
@ryestew

Remix

[remix-project.org](https://remix-project.org) @EthereumRemix

[medium.com/remix-ide](https://medium.com/remix-ide) [remix-ide.readthedocs.io](https://remix-ide.readthedocs.io)

Scan QR to join our discord



Section 3

# **Accessing Onchain Data with The Graph**

Edge & Node

# Accessing Onchain Data with The Graph



**Simon Emanuel Schmid**

Senior Developer Experience Engineer

DevCon 2024, Bangkok



# The Graph

Part 1

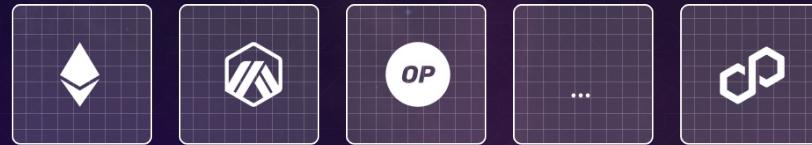
[Products](#) [Blog](#)[Security](#)[Jobs](#)[Ecosystem](#) [Docs](#)

EN

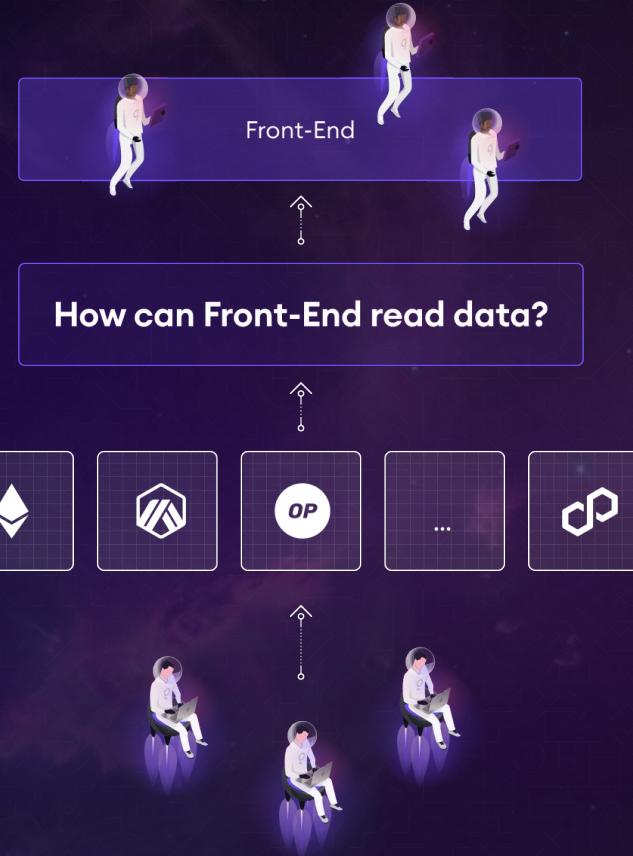
# Access the world's blockchain data

[Explore Data](#)[Get Started](#)

# The Blockchain is Write Optimized



# The Read Issue



```
function getTokenIdsByOwner(owner: string): Promise<Array<number>> {
 const balance: number = await(await getContract())
 .methods.balanceOf(owner)
 .call();
 const result = [];

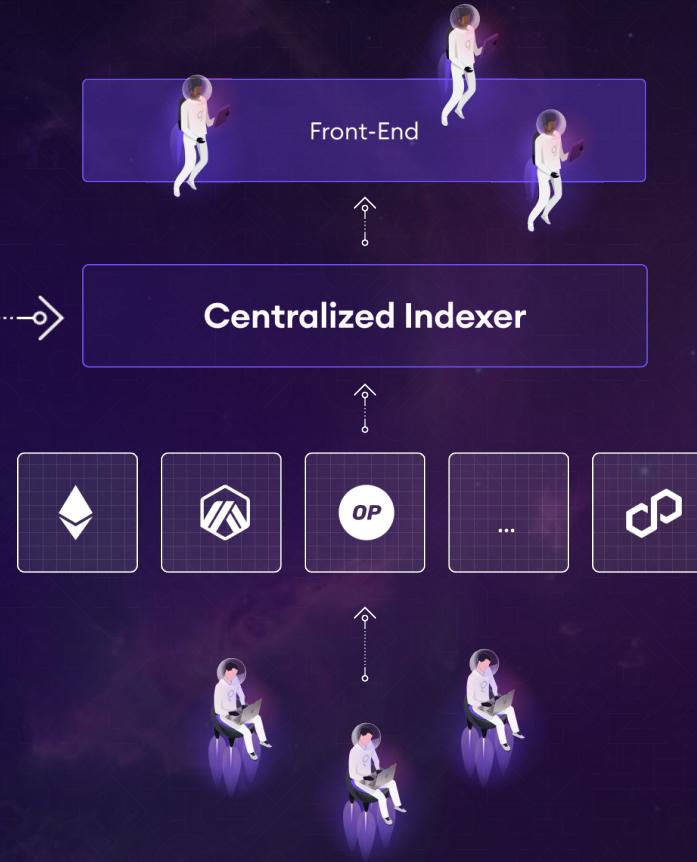
 for (let i = 0; i < balance; i++) {
 let p = (await getContract()).methods
 .tokenOfOwnerByIndex(owner, i)
 .call()
 .then((tokenId: any) => {
 return tokenId;
 });
 result.push(p);
 }

 return Promise.all(result);
}
```

# The Web2.5 Read Solution

## Centralized Indexers

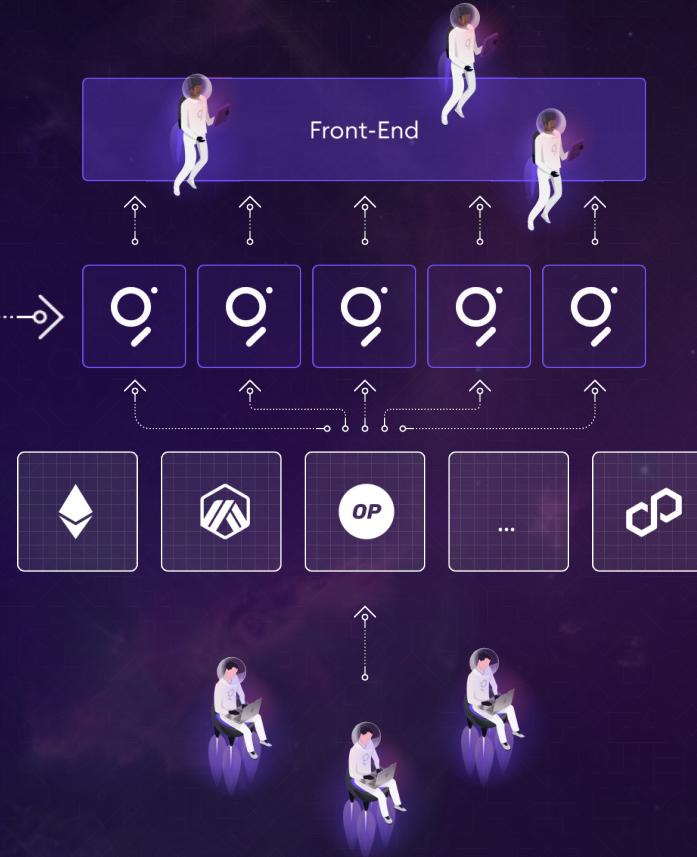
- ⇒ Single point of failure
- ⇒ Vendor lock-in



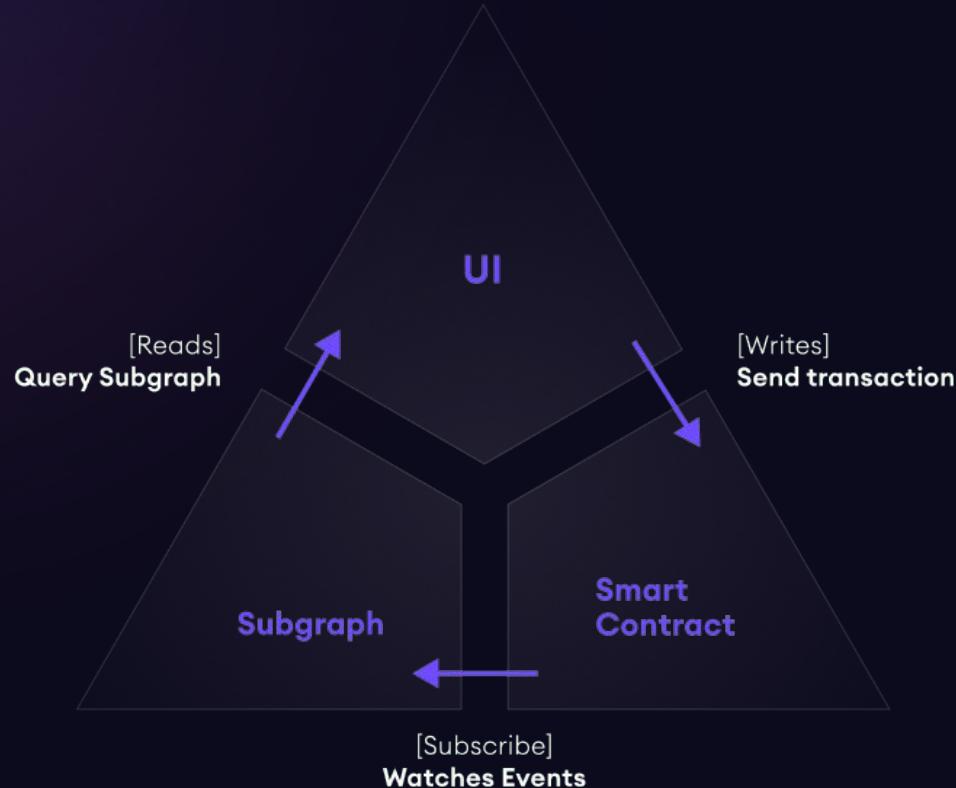
# The Web3 Read Solution

## The Graph

- Decentralized network of Indexers
- Fully Open Source (MIT) Stack
- Over 9000 subgraphs published



# Dapp Data Flow



# Network Participants

110

Indexers

174'386

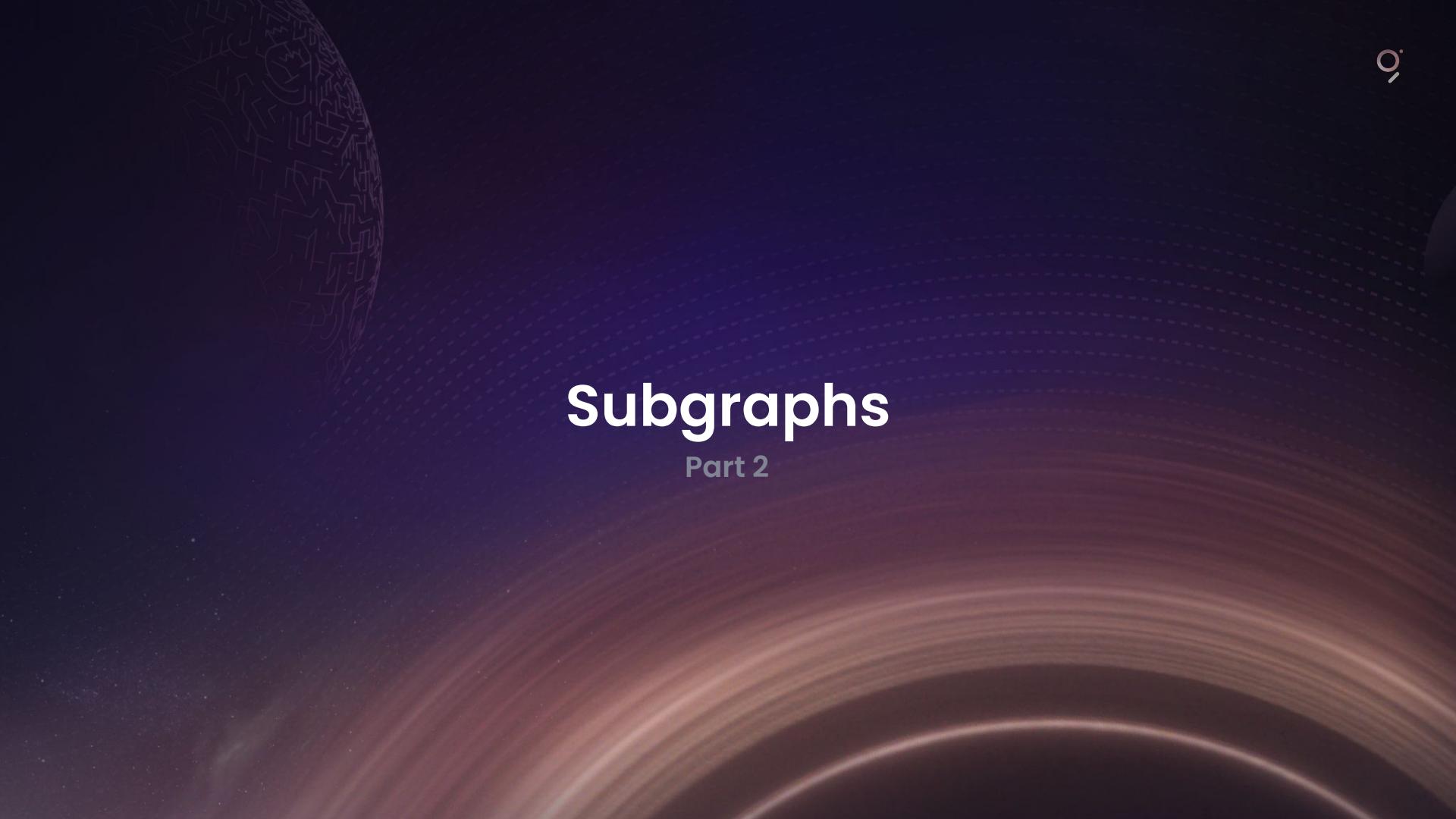
Delegators

889

Curators

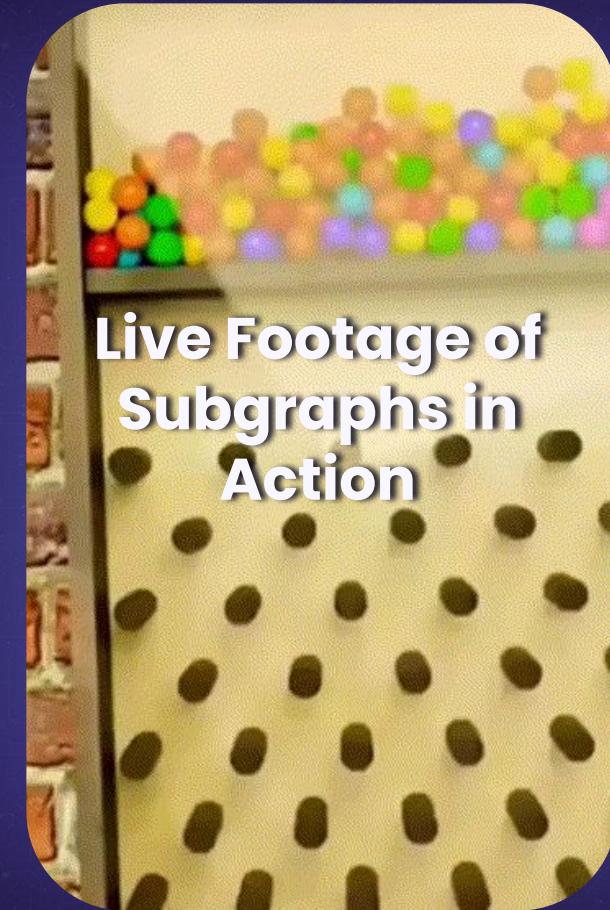
9'847

Subgraphs



# Subgraphs

Part 2



```
query NFTsOfOwner($owner: String) {
 nfts(where: {owner: $owner}) {
 id
 tokenId
 metaData
 previousOwners {
 id
 }
 }
}
```

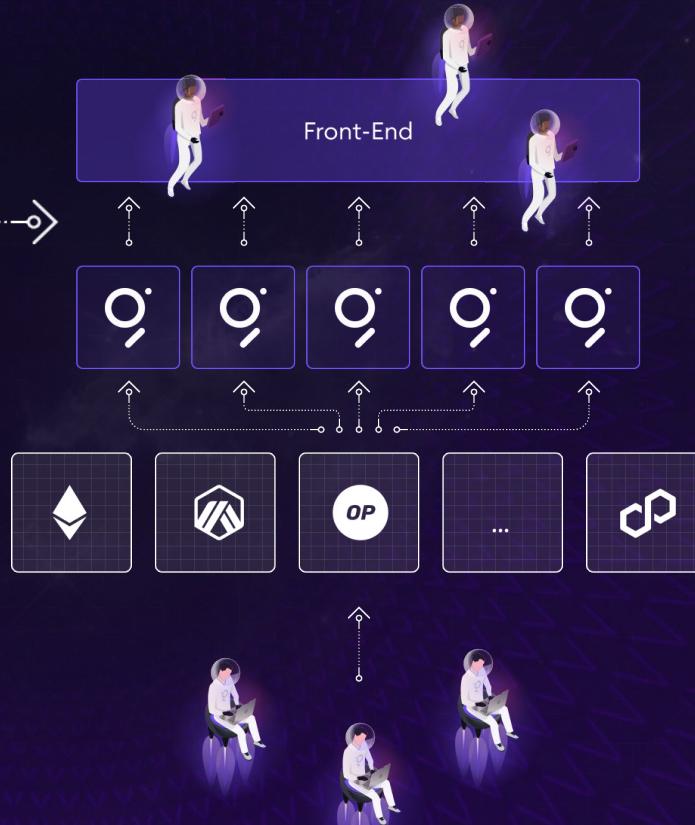


## Subgraphs Are Customizable APIs

- **Instructions for Indexers**
  - Tells Indexers how to structure their Databases
  - `ListEvent` data
- **Industry standard**

## Publish to the World Standard Registry

- **The Graph Explorer**



# Explore subgraphs

Search by name, creator or ID

Indexed Network ▾

Categories ▾

Curation Signal ▾



tpremia.eth

**premia-blue**

DeFi • Marketplaces • Infrastructure

QUERIES (1D) 278

SIGNAL 205.4K GRT



0xdada-760f7f

**Uniswap-V3**

QUERIES (1D) 1.4M

SIGNAL 59.8K GRT



0x421e-d6a94c

**Lido**

DeFi

QUERIES (1D) 201.2K

SIGNAL 55.6K GRT



streamingfastindexer.eth

**Substreams Uniswap v3 Ethereum**

QUERIES (1D) 22.1K

SIGNAL 55.5K GRT



test1.snapshot.eth

**snapshot**

DAOs • Governance • Infrastructure

QUERIES (1D) 448.7K

SIGNAL 54.8K GRT

# thegraph.com/studio

The screenshot shows the homepage of thegraph.com/studio. At the top, there is a navigation bar with the Subgraph Studio logo, followed by links for My Dashboard, API Keys, Billing, and Docs. To the right of these links is a 'Connect' button. The main content area features a large, stylized graphic of a rising sun or moon against a dark background. Below this graphic, the text 'DISCONNECTED WALLET' is displayed in a small, white, sans-serif font. Underneath this text is a large, bold, white call-to-action button that reads 'Connect wallet to use Studio'. At the bottom of the page, there is a purple rectangular button with the text 'Connect Wallet' in white.

Subgraph Studio ▾ My Dashboard API Keys Billing Docs

Connect

DISCONNECTED WALLET

Connect wallet to use Studio

Connect Wallet

# thegraph.com/studio

The screenshot shows the Subgraph Studio dashboard. At the top, there are navigation links: Subgraph Studio (dropdown), My Dashboard, API Keys, Billing, Docs, Support (dropdown), and a wallet address 0x1d5C-813B8F (dropdown). The main area is titled "My Dashboard" and shows a "Free Plan" with 0 queries made. A message states "You don't have any Subgraphs". On the left, there's a "Create a Subgraph" button with a plus sign and a subtext: "Craft a dataset that fits your dapp's needs." In the center, a modal window is open for "ACCOUNT VERIFICATION" for the address 0x1d5C-813B8F. It prompts the user to "Add an email address" and has a text input field containing "simon+devcon@edgeandnode.com". Below the input field, a note says "We use email to send notifications about your account." There is a checkbox for "Subscribe to [The Graph Builders newsletter](#)". A purple button at the bottom of the modal says "Send verification code →". At the bottom of the dashboard, there are links for "Already have an account?", "Switch wallet", and "Getting started".

Subgraph Studio ▾ My Dashboard API Keys Billing Docs

Support 0x1d5C-813B8F ▾

## My Dashboard

Free Plan | QUERIES MADE 0 /100,000

You don't have any Subgraphs

+

Create a Subgraph

Craft a dataset that fits your dapp's needs.

ACCOUNT VERIFICATION | 0x1d5C-813B8F

Add an email address

EMAIL ADDRESS

simon+devcon@edgeandnode.com

We use email to send notifications about your account.

Subscribe to [The Graph Builders newsletter](#)

Send verification code →

Already have an account? Switch wallet → Getting started

Create a Subgraph

# thegraph.com/studio

The screenshot shows the thegraph.com/studio dashboard. At the top, there is a navigation bar with links for Subgraph Studio, My Dashboard, API Keys, Billing, Docs, Support, and a wallet address (0x1d5C-813B8F). The main area is titled "My Dashboard" and shows a "Free Plan" with 0 queries made. A message states "You don't have any Subgraphs". On the left, there is a "Create a Subgraph" button with a plus sign and a subtext: "Craft a dataset that fits your dapp's needs." The central part of the dashboard is a "ACCOUNT VERIFICATION" section for the wallet address 0x1d5C-813B8F. It prompts the user to "Add an email address" and provides a text input field with the value "simon+devcon@edgeandnode.com". Below this, a note says "We use email to send notifications about your account." There is a checked checkbox for "Subscribe to [The Graph Builders newsletter](#)". A large purple button at the bottom of this section says "Send verification code →". At the bottom of the dashboard, there are links for "Already have an account?" and "Switch wallet" with a wallet icon. A "Getting started" link is also visible at the bottom right.

Subgraph Studio My Dashboard API Keys Billing Docs Support 0x1d5C-813B8F

## My Dashboard

Free Plan | QUERIES MADE 0 /100,000

You don't have any Subgraphs

+

Create a Subgraph

Craft a dataset that fits your dapp's needs.

ACCOUNT VERIFICATION | 0x1d5C-813B8F

Add an email address

EMAIL ADDRESS

simon+devcon@edgeandnode.com

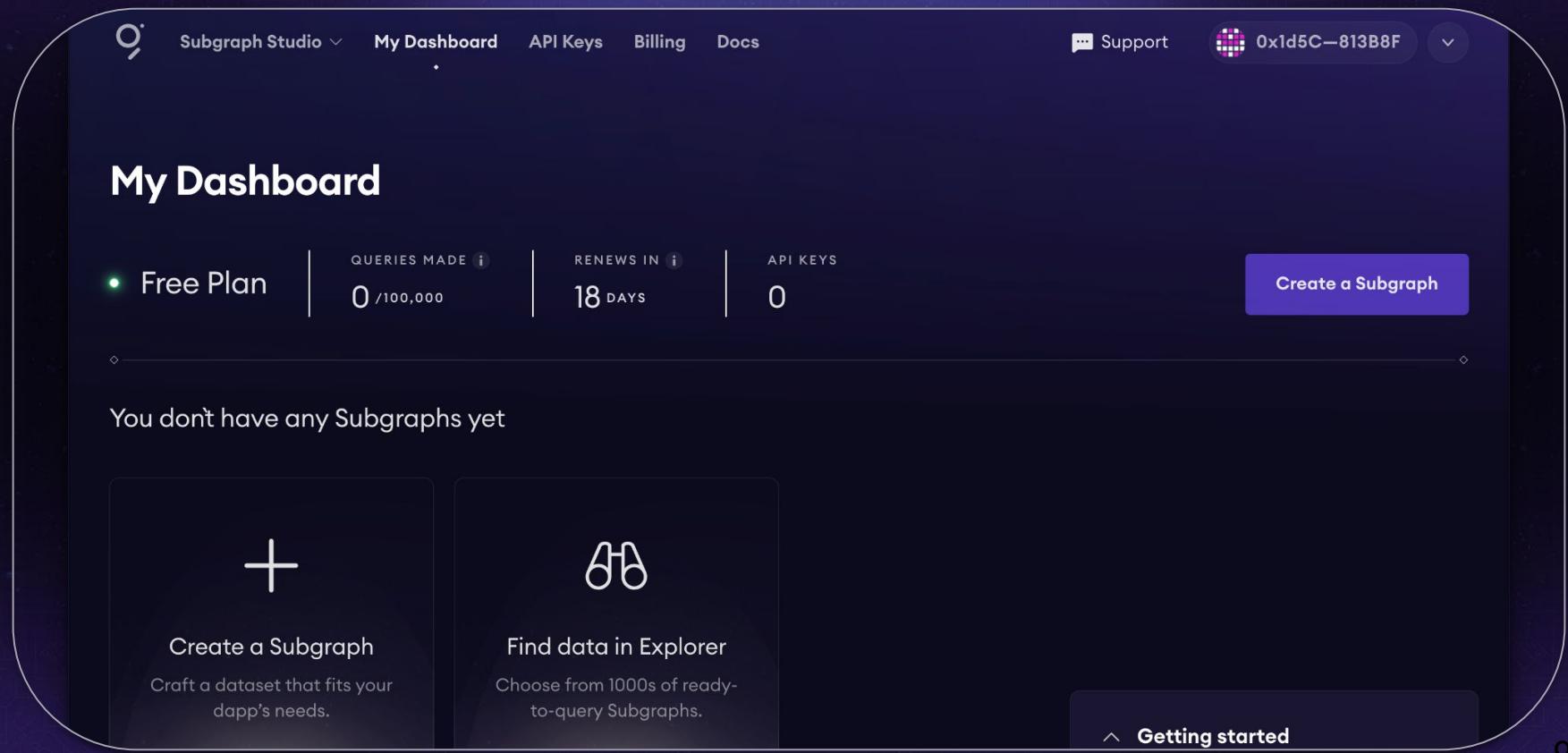
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Getting started



The screenshot shows the Subgraph Studio dashboard. At the top, there is a navigation bar with links to 'Subgraph Studio', 'My Dashboard', 'API Keys', 'Billing', and 'Docs'. To the right of the navigation is a 'Support' link, a user profile icon with the address '0x1d5C—813B8F', and a dropdown menu. The main title 'My Dashboard' is centered above a row of four cards. The first card, 'Free Plan', shows '0 /100,000' queries made and '18 DAYS' until renewal. The second card shows '0' API keys. To the right of these cards is a purple button labeled 'Create a Subgraph'. Below this row, a message states 'You don't have any Subgraphs yet'. At the bottom, there are two large cards: 'Create a Subgraph' with a plus sign icon and 'Find data in Explorer' with a search icon. A 'Getting started' button is located at the bottom right.

Subgraph Studio ▾ My Dashboard API Keys Billing Docs

Support 0x1d5C—813B8F ▾

## My Dashboard

• Free Plan

0 /100,000

18 DAYS

0 API KEYS

Create a Subgraph

You don't have any Subgraphs yet

+

Create a Subgraph

Craft a dataset that fits your dapp's needs.

Find data in Explorer

Choose from 1000s of ready-to-query Subgraphs.

Getting started

# thegraph.com/studio

Subgraph Studio ▾ My Dashboard API Keys Billing Docs

## My Dashboard

• Free Plan

QUERIES MADE	0 /100,000
REnews in	18 DAYS
API KEYS	0

You don't have any Subgraphs yet

 Create a Subgraph

Craft a dataset that fits your dapp's needs.

 Find data in Explorer

Choose from 1000s of ready-to-query Subgraphs.

## Create a Subgraph

SUBGRAPH NAME

devcon-bkk ✓ AVAILABLE 10/255

Create Subgraph



[thegraph.com/studio](http://thegraph.com/studio)

The screenshot shows the Subgraph Studio dashboard for the subgraph "DevCon BKK".

**Header:** Subgraph Studio, My Dashboard, API Keys, Billing, Docs, Support, User icon (0x1d5C-813B8F), and a dropdown menu.

**Subgraph Details:**

- Image:** A blue and green abstract image.
- Name:** DevCon BKK
- Status:** DRAFT
- Subgraph Slug:** devcon-bkk
- Deploy Key:** dd1eeb-e245db

**Buttons:** Publish and a three-dot menu.

**Form Fields:**

- DISPLAY NAME:** DevCon BKK (10/255 characters)
- Subgraph Description:** (Large text area)

**Deployment ID:** -

**Metrics:**

- SUBGRAPH CREATED:** a few seconds ago
- VERSION DEPLOYED:** -

**Links:** View Documentation →

**Footer:** INST (dropdown), Getting started (button), and a footer icon.

# thegraph.com/studio

Subgraph Description

Source Code URL

Website URL

**CATEGORIES** Select up to 3

DAOs DeFi Entertainment Gaming Governance Grants & Philanthropy

Identity Infrastructure Marketplaces NFTs Social Work Other

**Save**

SUBGRAPH CREATED

VERSION DEPLOYED

a few seconds ago -

[View Documentation →](#)

**INSTALL GRAPH CLI**

You can install Graph CLI with either npm or yarn.

Install Graph CLI using NPM

```
npm install -g @graphprotocol/graph-cli
```

Install Graph CLI using Yarn

```
yarn global add @graphprotocol/graph-cli
```

**INIT**

**AUTH & DEPLOY**

# thegraph.com/studio

Subgraph Description

Source Code URL

Website URL

**CATEGORIES** Select up to 3

DAOs DeFi Entertainment Gaming Governance Grants & Philanthropy  
Identity Infrastructure Marketplaces NFTs Social Work Other

Save

a few seconds ago

[View Documentation →](#)

› [INSTALL GRAPH CLI](#)

› [INIT](#)

Initialize your Subgraph.

[Initialize Subgraph](#)

```
graph init --studio devcon-bkk
```

› [AUTH & DEPLOY](#)

# In your Terminal

```
 See more help with --help
→ @schmidsi graph init devcon-bkk
 > Warning: In next major version, this flag will be removed. By default we will
 > stop initializing a Git repository.
✓ Protocol · ethereum
✓ Subgraph slug · devcon-bkk
✓ Directory to create the subgraph in · devcon-bkk
? Ethereum network ...
✓ Ethereum network · mainnet
✓ Contract address · 0x57f1887a8BF19b14fC0dF6Fd9B2acc9Af147eA85
✓ Fetching ABI from Etherscan
✓ Fetching Start Block
✓ Fetching Contract Name
✓ Start Block · 9380410
✓ Contract Name · BaseRegistrarImplementation
✓ Index contract events as entities (Y/n) · true
 Generate subgraph
 Write subgraph to directory
✓ Create subgraph scaffold
✓ Initialize networks config
✓ Initialize subgraph repository
✓ Install dependencies with yarn
✓ Generate ABI and schema types with yarn codegen
Add another contract? (y/n):
Subgraph devcon-bkk created in devcon-bkk
```

Next steps:

# In IDE

The screenshot shows a code editor interface with three main panes. The left pane is an outline showing project files: `DEVCON-BKK`, `abis`, `generated`, `node_modules`, `src` (containing `base-registrar-impl.ts`), `tests`, `.gitignore`, `docker-compose.yml`, `networks.json`, `package.json`, `schema.graphql`, `subgraph.yaml` (selected), and `tsconfig.json`. The middle pane shows the `schema.graphql` file with the following content:

```
type Approval @entity(immutable: true) {
 id: Bytes!
 owner: Bytes! # address
 approved: Bytes! # address
 tokenId: BigInt! # uint256
 blockNumber: BigInt!
 blockTimestamp: BigInt!
 transactionHash: Bytes!
}
```

The right pane shows the `subgraph.yaml` file with the following content:

```
specVersion: 1.0.0
indexerHints:
 prune: auto
schema:
 file: ./schema.graphql
dataSources:
 - kind: ethereum
 name: BaseRegistrarImplementation
 network: mainnet
 source:
 address: "0x57f1887a8BF19b14fC0dF6F...
 abi: BaseRegistrarImplementation
 startBlock: 9380410
 mapping:
 kind: ethereum/events
 apiVersion: 0.0.7
 language: wasm/assemblyscript
 entities: ...
 abis:
 - name: BaseRegistrarImplementation
 file: ./abis/BaseRegistrarImplementation...
 eventHandlers:
 - event: Approval(indexed address, handler: handleApproval)
 - event: ApprovalForAll(indexed address, handler: handleApprovalForAll)
 - event: ControllerAdded(indexed address, handler: handleControllerAdded)
```

The code editor has a status bar at the bottom with the text "DEVCON-BKK" and "96".

[thegraph.com/studio](http://thegraph.com/studio)

Source Code URL

✓ AUTH & DEPLOY

Authenticate within the CLI, build and deploy your Subgraph to the Studio.

## Authenticate in CLI

```
graph auth --studio
```

## Enter Subgraph

```
cd devcon-bkk
```

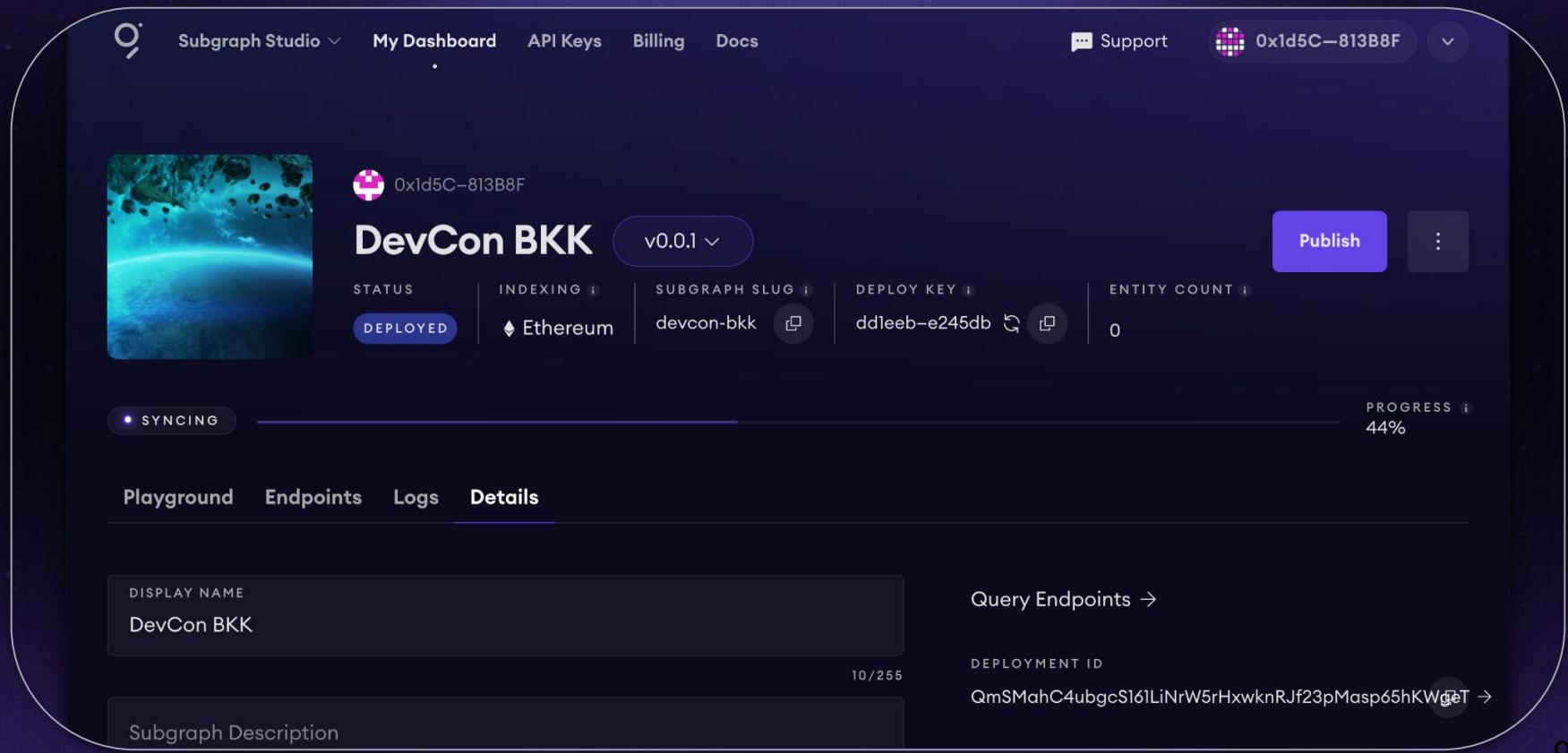
## Build Subgraph

```
graph codegen && graph build
```

## Deploy Subgraph

```
graph deploy --studio devcon-bkk
```

# thegraph.com/studio



The screenshot shows the Subgraph Studio interface for a subgraph named "DevCon BKK".

**Header:** Subgraph Studio, My Dashboard, API Keys, Billing, Docs, Support, 0x1d5C-813B8F, and a dropdown menu.

**Subgraph Overview:**

- Image:** A blue and green abstract image.
- Address:** 0x1d5C-813B8F
- Name:** DevCon BKK
- Version:** v0.0.1
- Status:** DEPLOYED
- Indexing:** Ethereum
- Subgraph Slug:** devcon-bkk
- Deploy Key:** dd1eeb-e245db
- Entity Count:** 0
- Progress:** 44%

**Buttons:** Publish and a three-dot menu.

**Navigation:** Playground, Endpoints, Logs, Details (selected).

**Details Section:**

- Display Name:** DevCon BKK
- Progress:** 10/255
- Query Endpoints:** →
- Deployment ID:** QmSMahC4ubgcS161LiNrW5rHxwknRJf23pMasp65hKWget →
- Subgraph Description:** (Text area)

# thegraph.com/studio

SYNCING 44%

Playground Endpoints Logs Details

Untitled Query Save as new Cancel ...

```
{
 approvals(first: 5) {
 id
 owner
 approved
 tokenId
 }
 approvalForAlls(first: 5) {
 id
 owner
 operator
 approved
 }
}
```

▶

```
{
 "data": {
 "approvals": [
 {
 "id": "0x48956134d4f13088eb19eb857640ad73d320722ed1788079422977489c25dfc160000000",
 "owner": "0x6109dd117aa5486605fc85e040ab00163a75c662",
 "approved": "0xe65d8aaaf34cb91087d1598e0a15b582f57f217d9",
 "tokenId": "66009673573934127458796487489870586196874531029878886926537526355567350614977"
 },
 {
 "id": "0x64a9a6f0e6ba03c2cda4a46431131c5122b7849176da3eec2a1f5ed7d834e29a53000000",
 "owner":
 }
]
 }
}
```

99

# Scaffold-ETH 2 & The Graph

Part 3

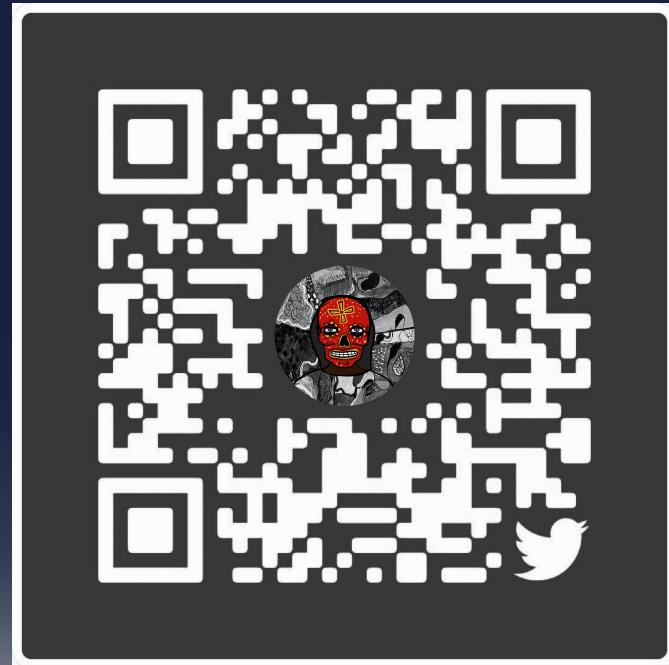
• • •

```
$ npx create-eth@latest -e subgraph
```

# Thank you



**Simon Emanuel Schmid**  
Developer Relations Manager



**Enter your main point / statement here.**

# Section 3 details with a main point. Enter title here.

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Section 4

## **Section 4 title here.**

# Section 4 details with a main point. Enter title here.

**Enter your main point / statement here.**

**Enter your main point /  
statement here.**

# Here's the timeline.

## Event 1



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## Event 2



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## Event 3



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# 99.99%

“Number rules the universe.”  
— Pythagoras

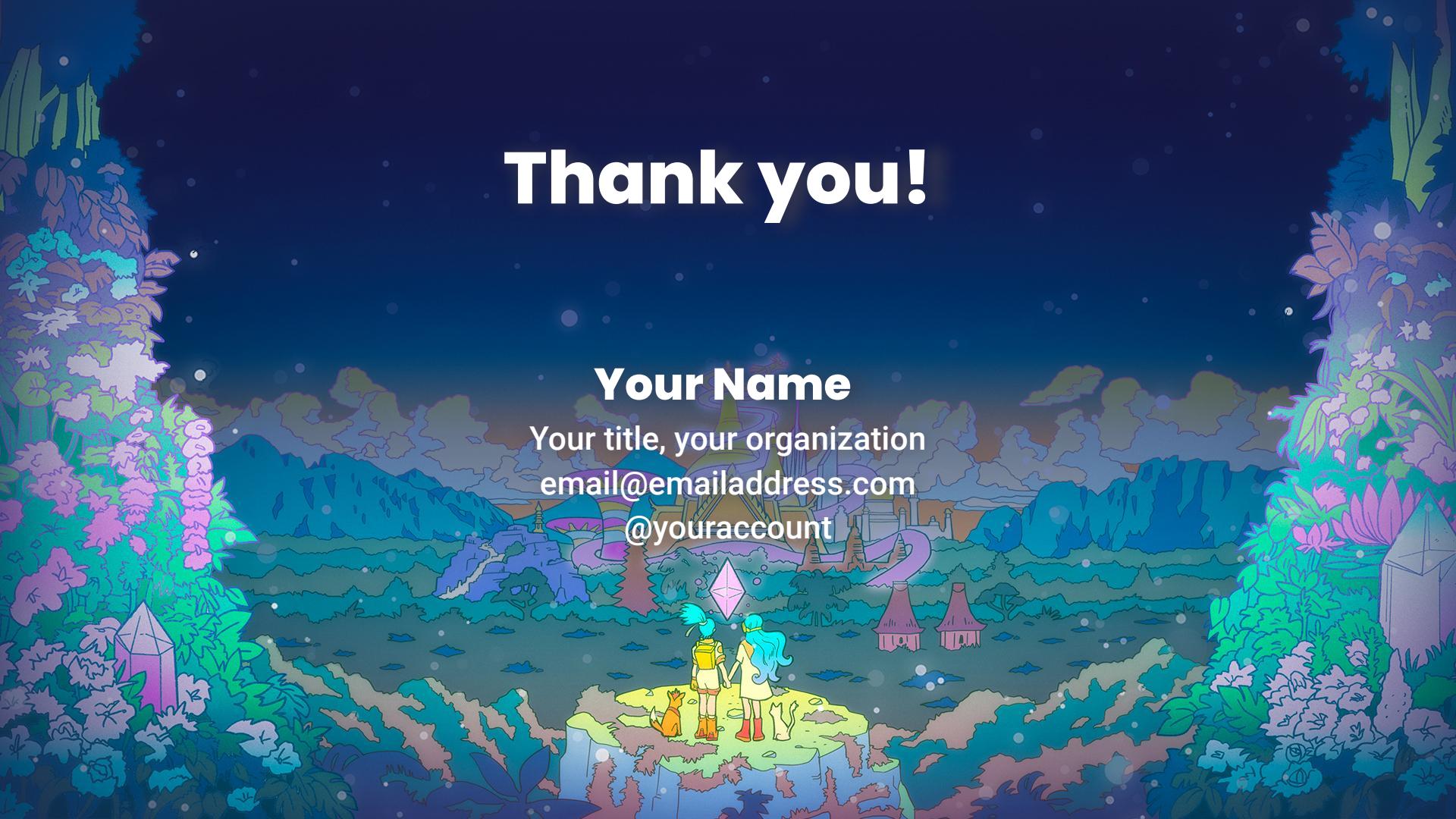
# Thank you!

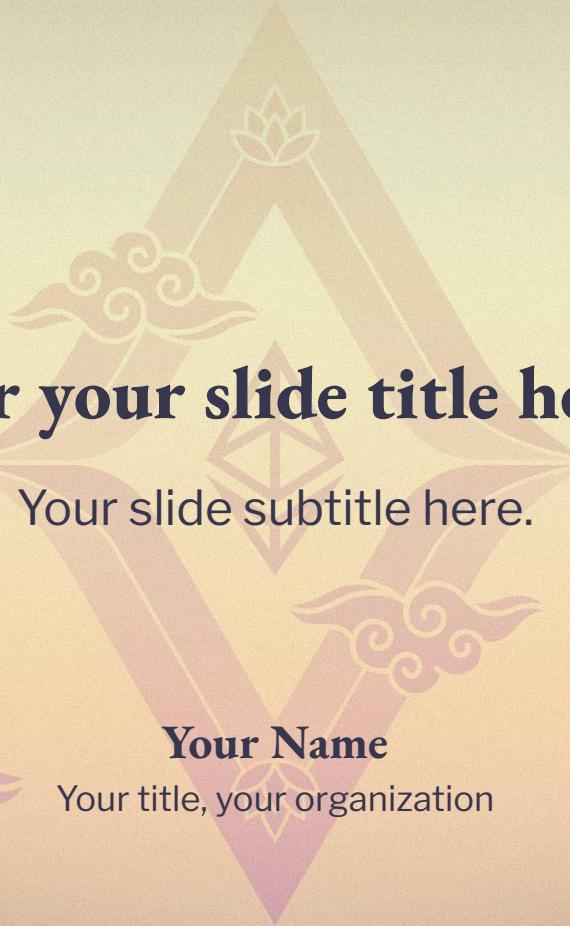
**Your Name**

Your title, your organization

[email@emailaddress.com](mailto:email@emailaddress.com)

[@youraccount](https://twitter.com/@youraccount)





**Enter your slide title here**

Your slide subtitle here.

**Your Name**

Your title, your organization





# Section 1 title here.



# Section 1 details with an image. Enter title here.

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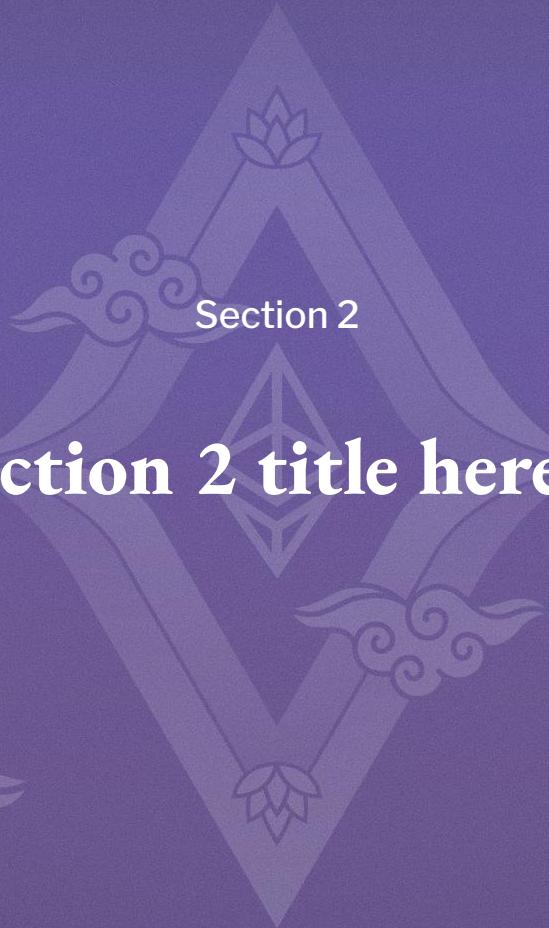
# Section 1 title here.

- Sollicitudin
  - Consectetur
    - Condimentum
      - Magna
      - Ligula

Enter your main point / statement here.

# Section 1 details with a main point. Enter title here.

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## Section 2 title here.



## Section 2 title here.

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## **Section 2 details with an image. Enter title here.**

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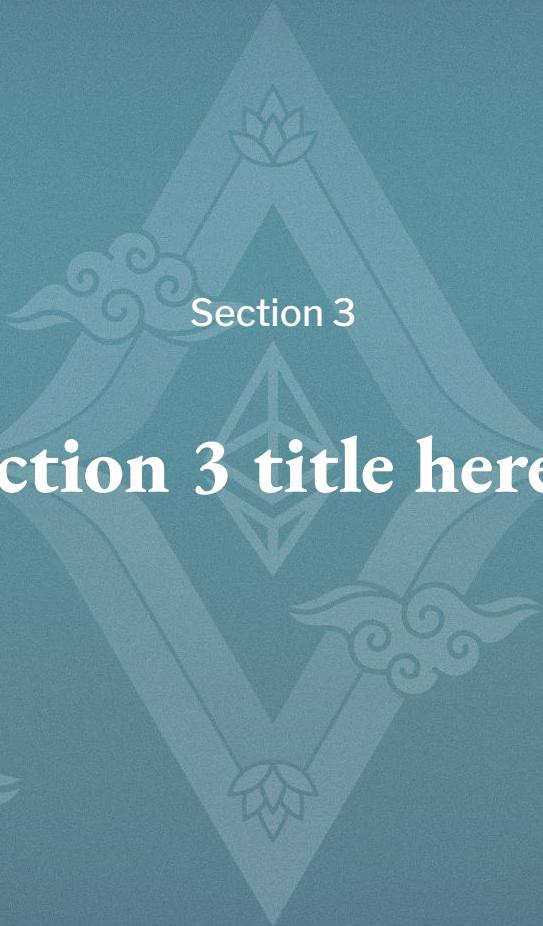


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Section 3

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Section 4

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## **Section 4 details with a main point. Enter title here.**

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**Enter your main point / statement here.**

# Here's the timeline.



## Event 1



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## Event 2



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## Event 3



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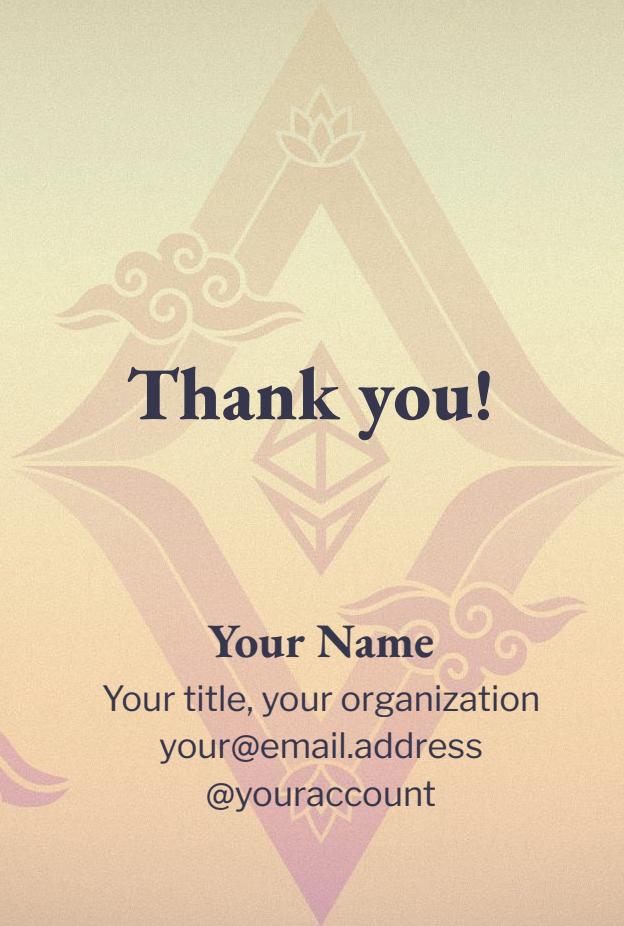


# 99.99%

“Number rules the universe.”

— Pythagoras





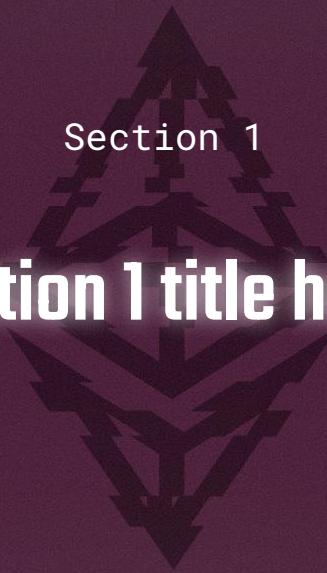


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Your slide subtitle here.

Your Name

Your title, your organization



Section 1

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# Section 1 details with an image.

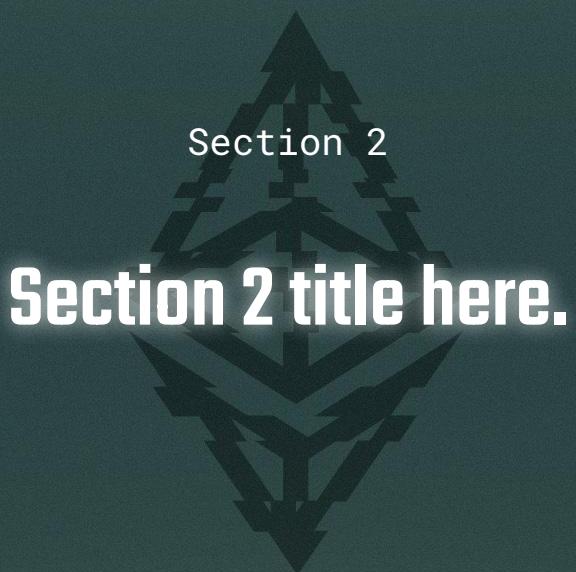
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Section 2

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## Section 2 title here.

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## Section 2 details with an image.

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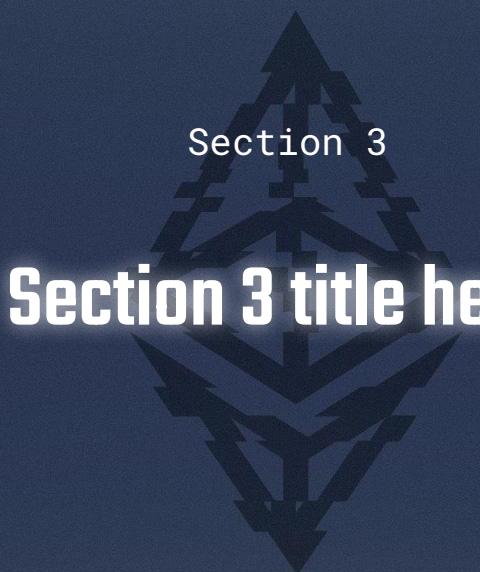
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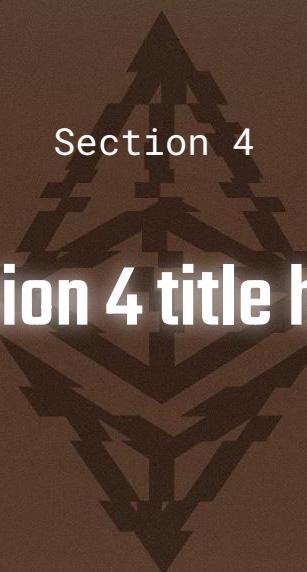
Section 3

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statement here.

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Section 4

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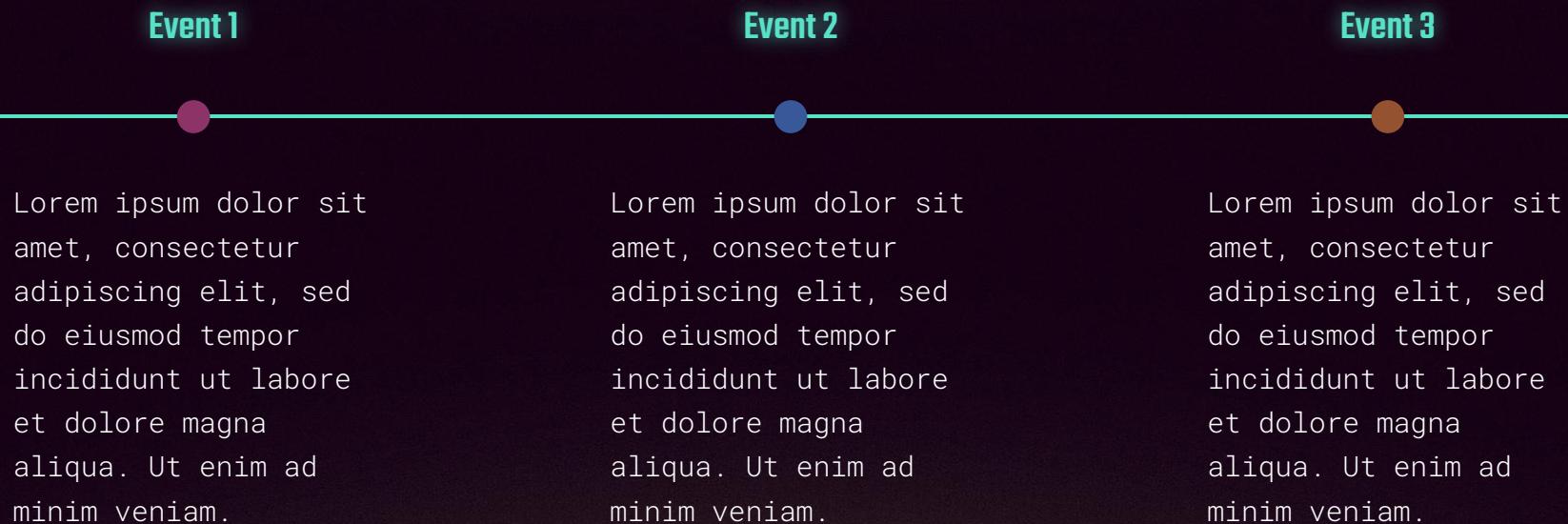
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**Enter your main point / statement here.**

**Enter your main point / statement here.**

## Here's the timeline.



# 99.99%

“Number rules the universe.”  
– Pythagoras



Your title, your organization  
your@email.address  
@youraccount