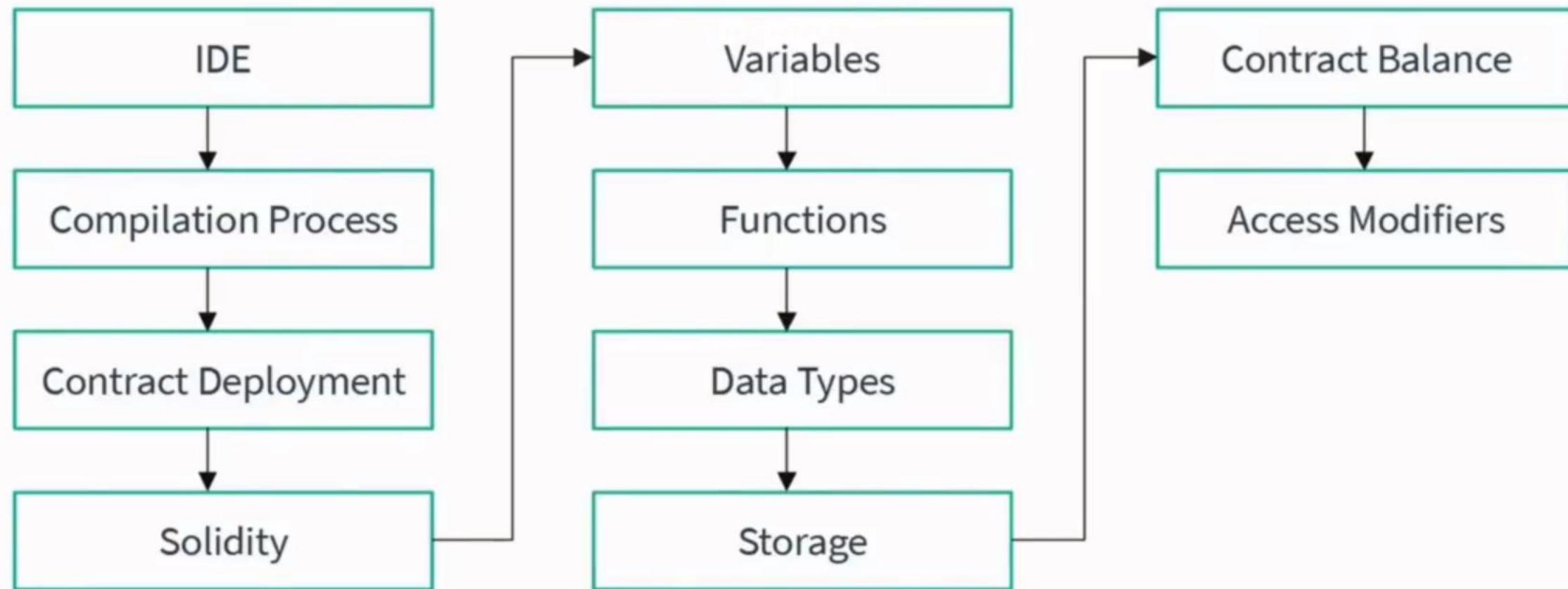


Solidity

Dr. Bahar Ali
Assistant Professor (CS), National University Of Computer and Emerging Sciences,
Peshawar.

Solidity Full Course Overview



Prerequisite of Solidity Course

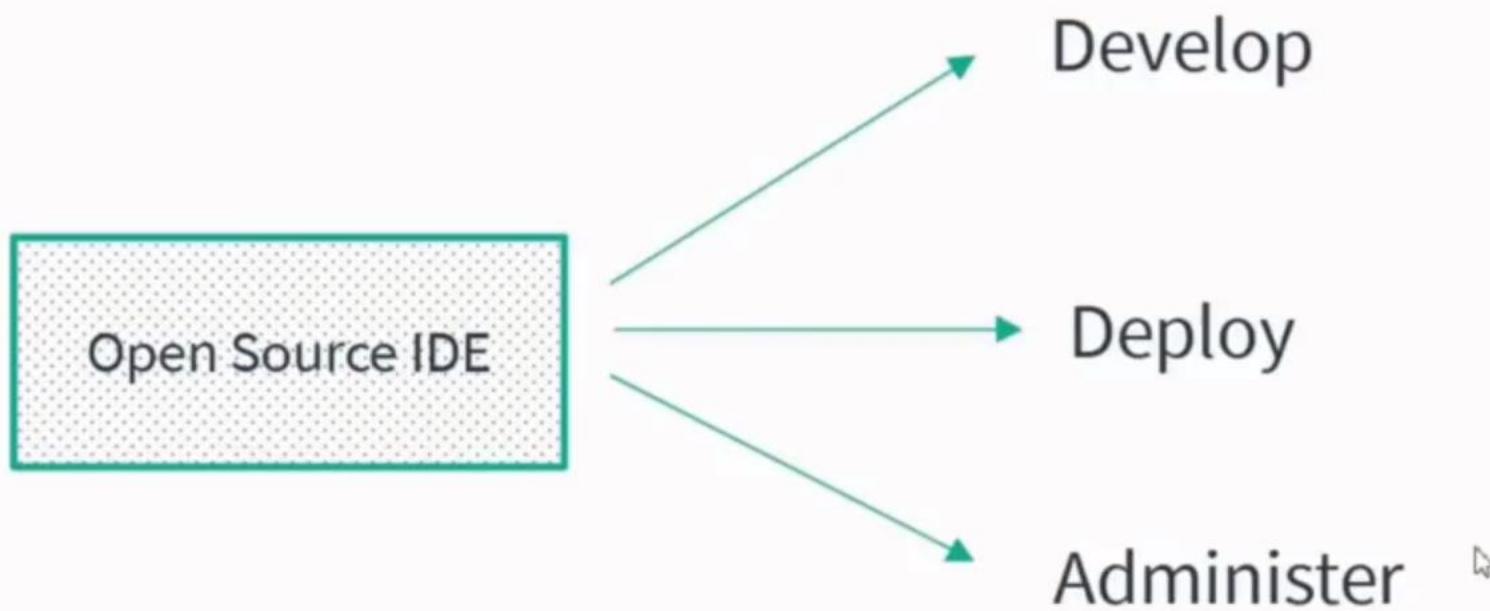
Prerequisite

Blockchain

Ethereum

Know any
Programming Language

Remix IDE

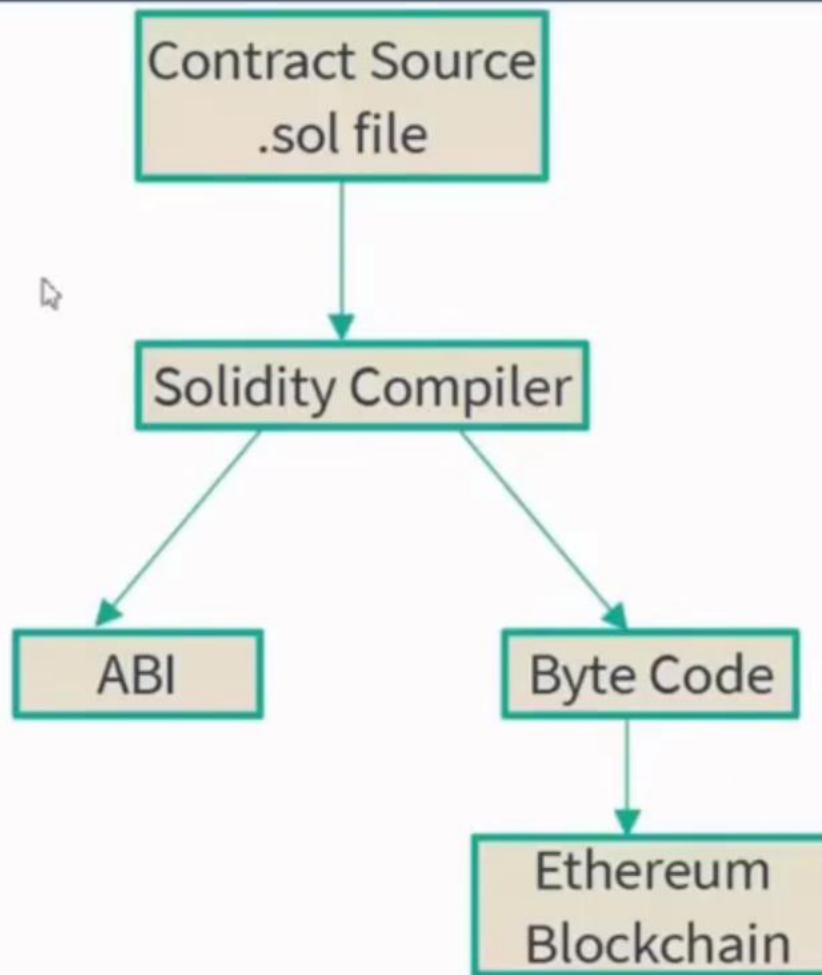


Remix IDE

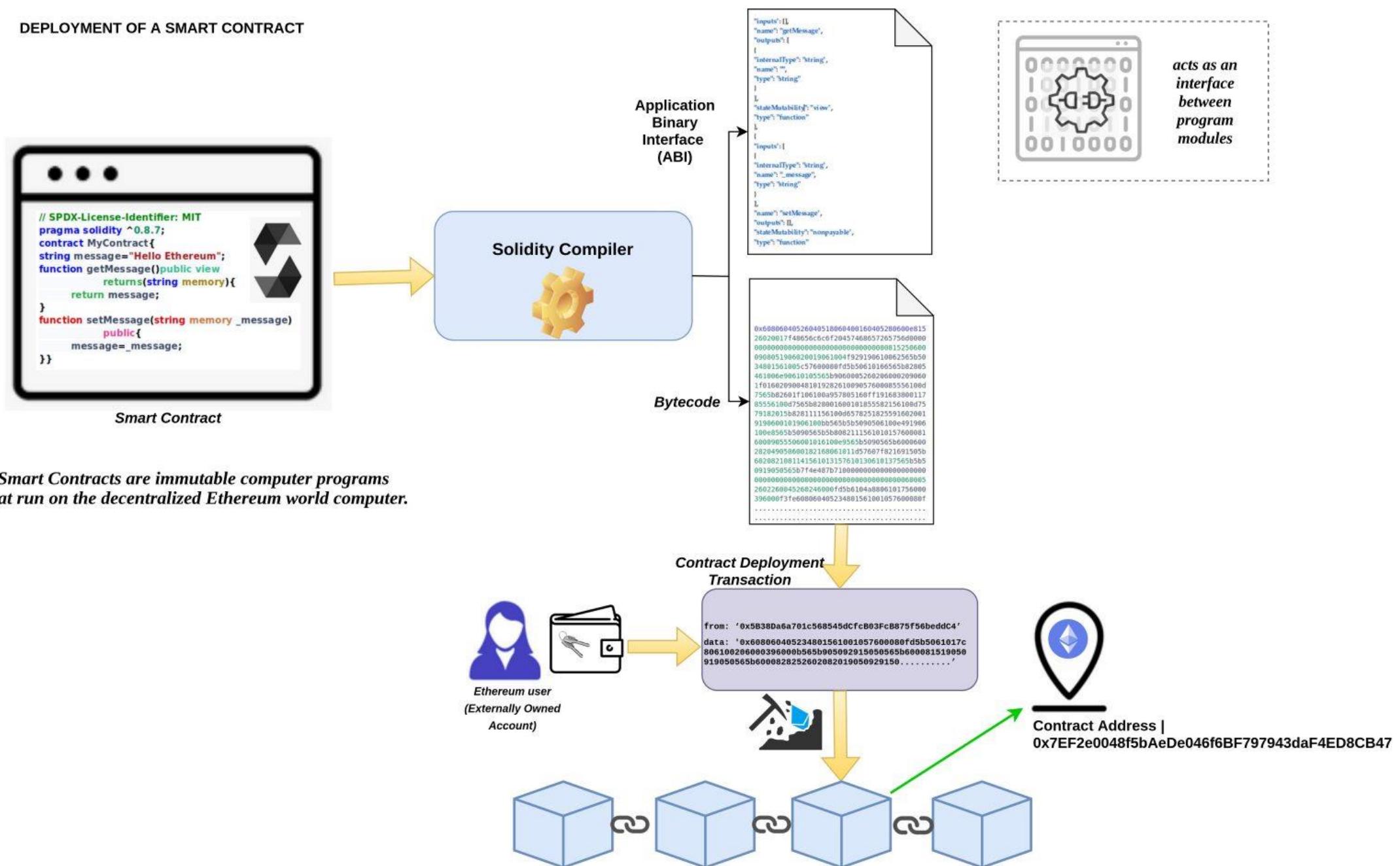
Some important to know about Remix IDE-

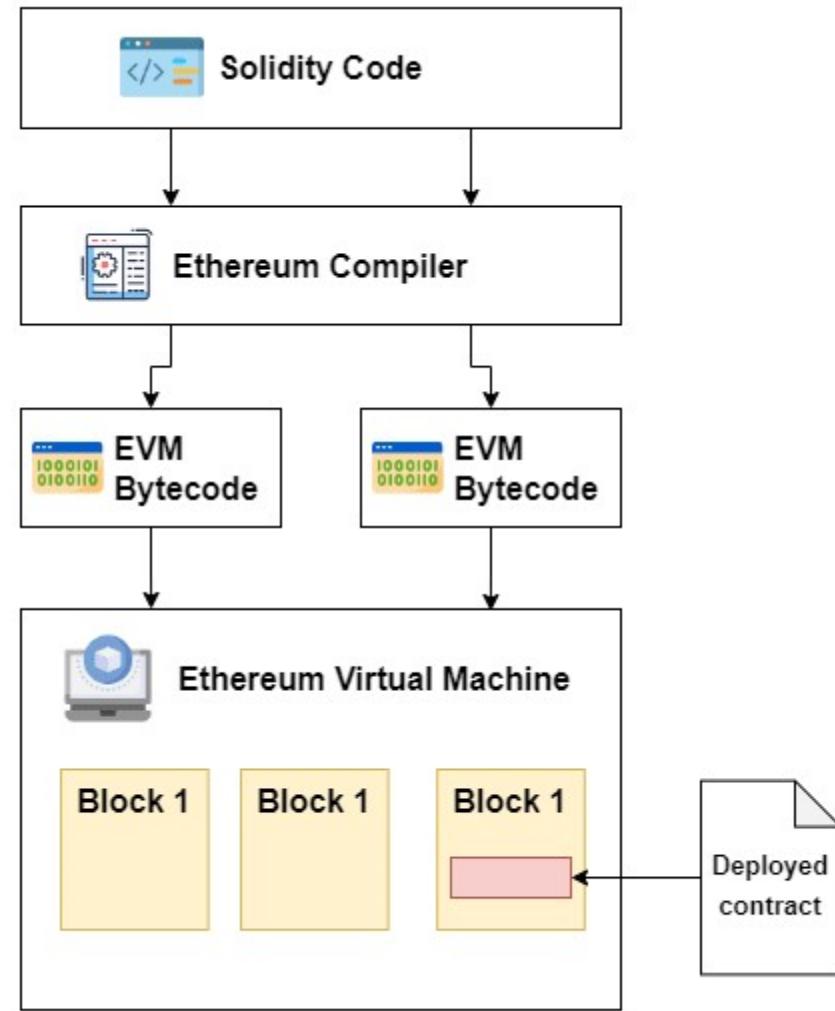
- **Language Support -** Solidity and Vyper
- **Written in -** JavaScript
- **Modules -** Testing , Debugging , Deploy

Smart Contract Compilation



DEPLOYMENT OF A SMART CONTRACT





google.com/search?q=bytecode+to+opcode+disassembler&oq=bytecode+to+opcode+d&aqs=chrome.1.69i57j0j11435j0j7&sourceid=chrome&ie=UTF-8

Google bytecode to opcode disassembler

All Images Videos News Shopping More Tools

About 59,700 results (0.49 seconds)

<https://etherscan.io> › opcode-tool

Bytecode to Opcode Disassembler | Etherscan

Ethercan ByteCode to Opcodes Disassembler and Decoder tool enable decoding the low level Contract ByteCodes to Opcodes.

<https://hecoinfo.com> › opcode-tool

Bytecode to Opcode Disassembler | Hecoinfo

Ethercan ByteCode to Opcodes Disassembler and Decoder tool enable decoding the low level Contract ByteCodes to Opcodes.

<https://docs.python.org> › library › dis

dis — Disassembler for Python bytecode — Python 3.9.6 ...

The CPython bytecode which this module takes as an input is defined in the file Include/opcode.h and used by the compiler and the interpreter. CPython ...

<https://github.com> › daejunpark › evm-disassembler

EVM ByteCode To Opcode Disassembler - GitHub

EVM ByteCode To Opcode Disassembler. Quick Run: \$ echo "0x600035601c52" | python3.6 byte2op.py [0] PUSH1 0:0x00 [2] ...

<https://ethereum.stackexchange.com> › questions › why-...

Why are there missing opcodes when using the disassembler ...

<https://etherscan.io/opcode-tool>

Remix - Ethereum IDE Notepad | Online Notes free, no Google ethereum opcodes - Google Search Bytecode to Opcode Disassembler +

etherscan.io/opcode-tool

Etherscan

All Filters ▾ Search by Address / Txn Hash / Block / Token / Ens

Eth: \$2,114.75 (-1.04%) | 11 Gwei

Home Blockchain ▾ Tokens ▾ Resources ▾ More ▾ Sign In

Bytecode to Opcode Disassembler

Attempts to decode the low level Contract ByteCodes to Opcodes

0x

Decode

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Etherscan is a Block Explorer and Analytics Platform for

Smart Contract Compilation

Some important points to note:-

- Contract bytecode is public in readable form.
- Contract doesn't have to be public.
- Bytecode is immutable.
 -
- ABI act as a bridge between applications and smart contract.
- ABI and Bytecode cannot be generated without source code.

Mainnet vs Testnet

Mainnet	Testnet
Used for actual transactions with value.	Used for testing smart contracts and decentralized applications.
Mainnet's network ID is 1.	Testnets have network IDs of 3, 4, and 42.
Example - Ethereum	Example – Rinkeby Test Network

Crypto Mainnet vs Testnet: What's the Difference?

Rinkeby: Network Dashboard

Ethereum Blocks | Etherscan

OFFICIAL ETHEREUM TESTNET

Master the Cryptocurrency Market

Mainnet
Network ID = 1
Genesis Block = {[mainnet]..}

Ropsten
Network ID = 3
Genesis Block = {[ropsten]..}

Input Parameters:
Network ID = 1
Genesis Block = {[mainnet]..}

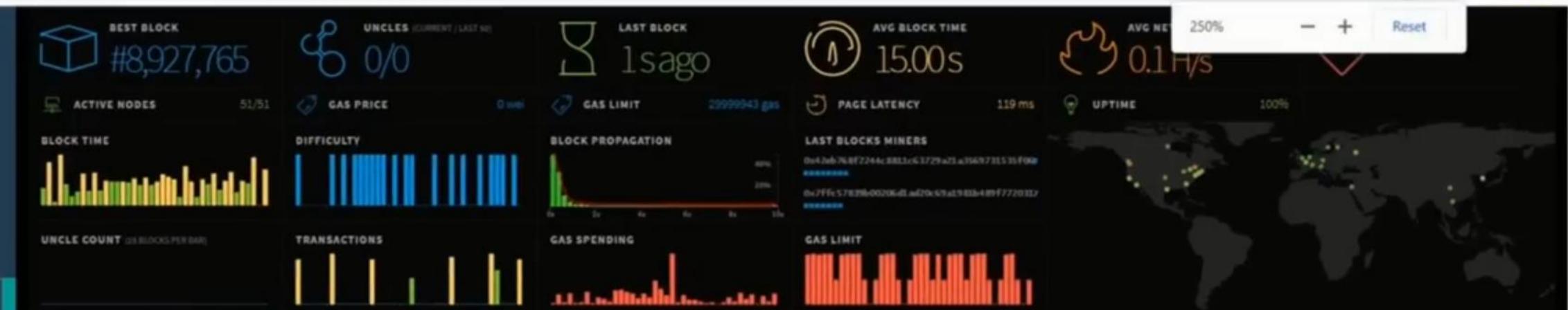
Input Parameters:
Network ID = 3
Genesis Block = {[ropsten]..}

New node

Ropsten is the most popular public testnet for Ethereum and is often used as a testing network for

A circular icon with a grid of dots and a central vertical bar, representing network monitoring or statistics.

Block
Explorer



This page does not represent the entire state of the ethereum network - listing a node on this page is a voluntary process.

Sponsored:  Crypto.com - Buy ETH at True Cost - Lowest fees for credit/debit card purchases. [Download App.](#)

Block #12816810 to #12816834 (Total of 12,816,835 blocks)

First < Page 1 of 512674 > Last

Block	Age	Txn	Uncles	Miner	Gas Used	Gas Limit	Avg.Gas Price	Reward
12816834	52 secs ago	179	0	xnpool	<u>14,893,716 (99.93%)</u>	14,903,662	71.69 Gwei	3.06779 Ether
12816833	1 min ago	160	0	MiningPoolHub	<u>14,915,859 (99.98%)</u>	14,918,229	29.72 Gwei	2.44337 Ether
12816832	1 min ago	116	0	Spark Pool	<u>14,914,410 (99.88%)</u>	14,932,810	22.46 Gwei	2.335 Ether
12816831	1 min ago	187	0	0x54e23bcc99e5a5818b...	<u>14,910,933 (99.90%)</u>	14,925,542	32.88 Gwei	2.49027 Ether
12816830	1 min ago	191	0	F2Pool Old	<u>14,930,627 (99.94%)</u>	14,940,130	33.31 Gwei	2.4973 Ether
12816829	1 min ago	169	0	2Miners: PPLNS	<u>14,922,755 (99.98%)</u>	14,925,556	25.73 Gwei	2.38403 Ether
12816828	2 mins ago	153	0	Hiveon Pool	<u>14,916,774 (99.84%)</u>	14,940,144	26.27 Gwei	2.3919 Ether
12816827	2 mins ago	196	0	zhizhu.top	<u>14,947,768 (99.95%)</u>	14,954,747	33.79 Gwei	2.50515 Ether
12816826	2 mins ago	157	0	MiningPoolHub	<u>14,933,366 (99.91%)</u>	14,947,468	27.54 Gwei	2.41128 Ether
12816825	2 mins ago	131	0	Spark Pool	<u>14,944,031 (99.88%)</u>	14,962,078	28.57 Gwei	2.42696 Ether

Contract Deployment

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.4+commit.c7e474f2.js

2 tabs

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT

- JavaScript VM (Berlin)
- JavaScript VM (Berlin)
- JavaScript VM (London)
- Injected Web3
- Web3 Provider**

GAS LIMIT
3000000

Execution environment connects to node at localhost (or via IPC if available). transactions will be sent to the network and can cause loss of money or worse!
If this page is served via https and you access your node via http, it might not work. In this case, try cloning the repository and serving it via http.

VALUE

0 wei

CONTRACT

NO COMPILED CONTRACTS

OR

At Address Load contract from Address

3_Ballot.sol

```
// 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 {
        string name;
        uint8 vote;
        bool voted;
    }
    mapping(address => Voter) voters;
    uint8 totalVotes;
}
```

listen on network

Search with transaction hash or address

You can use this terminal to:

- Check transactions details and start debugging.
- Execute JavaScript scripts:
 - Input a script directly in the command line interface
 - Select a Javascript file in the file explorer and then run `remix.execute()` or `remix.exeCurrent()` in the command line interface
 - Right click on a JavaScript file in the file explorer and then click 'Run'

The following libraries are accessible:

- [web3 version 1.0.0](#)
- [ethers.js](#)
- [swarmgw](#)
- remix (run remix.help() for more info)

Contract Deployment

JavaScript Virtual Machine

- Transaction will be executed in a sandbox.
- Own memory  blockchain.
- Ideal for testing.

Contract Deployment

Injected Web3

- Deploy a contract or run a transaction on Ethereum main or test net.



Contract Deployment

Web3 Provider-

- Connect to a remote node and Ethereum client.



About Solidity

- High-level statically typed programming language.
- With Solidity you can create contracts for uses such as voting, crowdfunding, blind auctions, and multi-signature wallets.
- Case sensitive.
- For latest update- Visit Solidity documentation

Note – You should follow established development best-practices when writing your smart contracts.

solidity documentation - Google

google.com/search?q=solidity+documentation&sxsrf=ALeKk02InYjlBjebblCylFDI3Bbx-N-8rw%3A1626159172772&ei=RDjtYJXWLpOR9QOwgoGoCg&oq=solidity+do&gs_lcp=Cgdnd3Mtd2l6EAMYADI...

solidity documentation

All Videos News Images Shopping More Tools

About 74,40,000 results (0.48 seconds)

<https://docs.soliditylang.org> ▾

Solidity — Solidity 0.8.6 documentation

Solidity is a curly-bracket language. It is influenced by C++, Python and JavaScript, and is designed to target the Ethereum Virtual Machine (EVM). You can find ...

Documentation

1. Understand the Smart Contract
Basics · 2. Get to Know Solidity ...

V0.8.0

Solidity is an object-oriented, high-level language for ...

More results from soliditylang.org »

People also ask

Is solidity easy to learn?

How do you write solidity code?

In what language is solidity written?

What is the latest solidity version?

Feedback

Solidity Sample

Remix - Ethereum IDE x +

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.4+commit.c7e474f2.js

Home identity.sol Lottery.sol 1_Storage.sol 4 tabs

DEPLOY & RUN TRANSACTIONS

Transactions recorded 1

Deployed Contracts

IDENTITY AT 0xD91...39138 (MEMORY) copy X

getAge
0: uint256: 17

getName
0: string: Ravi

Low level interactions

CALldata

Transact

```
2 pragma solidity >= 0.5.0 < 0.9.0;
4
5 contract Identity
6 {
7     string name;
8     uint age;
9
10    constructor() public
11    {
12        name="Ravi";
13        age=17;
14    }
15
16    function getName() view public returns(string memory)
17    {
18        return name;
19    }
20
21    function getAge() view public returns(uint)
22    {
23        return age;
24    }
25 }
```

listen on network Search with transaction hash ...

State Variables



DEPLOY & RUN TRANSACTIONS

CONTRACT

State - state.sol

Deploy

Publish to IPFS

OR

At Address

Load contract from Address

Transactions recorded 22

Deployed Contracts

STATE AT 0X1C9...2B4BD (MEMORY)



age

0: uint256: 0

Low level interactions

CALLDATA

Transact

FunctionDefinition

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >= 0.5.0 < 0.9.0;
4
5 contract State
6 {
7     uint public age;
8     age=20;
9
10    function setAge() public
11    {
12        age=10;
13    }
14 }
```



listen on network



Search with transaction hash or address

State Variable

- To change the default values of the state variable -

Using the contracts constructor.

Initializing the variable at declaration.

Using the setter function.

State Variables

- Permanently stored in contract storage.
- Cost gas(expensive) .
- Storage not dynamically allocated. **Unlike Python, not a dynamic type language.**
- Instance of the contract cannot have other state variables besides those already declared.



Local Variables

Some data types are storage by default i.e String, Struct, Array, etc.



SOLIDITY COMPILER

Solidity

EVM VERSION

compiler default

COMPILER CONFIGURATION

Auto compile

Enable optimization

200

Hide warnings

Compile state.sol

CONTRACT

local (state.sol)

Publish on Swarm

Publish on Ipfs

Compilation Details

ABI Bytecode

Home state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >= 0.5.0 < 0.9.0;
4
5 contract local
6 {
7
8 function store() pure public returns(uint)
9 {
10     string memory name="ravi";
11     uint age=11;
12     return age;
13 }
14 }
```

▲ ◻ 0

 listen on network

Q

Search with transaction hash or address

Local Variables

- Declared inside functions and are kept on the stack , not on storage.
- Don't cost gas.
- There are some types that reference the storage by default.
- Memory keyword can't be used at contract level.



SOLIDITY COMPILER

Solidity

EVM VERSION

compiler default

COMPILER CONFIGURATION

Auto compile

Enable optimization

200

Hide warnings

Compile state.sol

CONTRACT

local (state.sol)

Publish on Swarm

Publish on Ipfs

Compilation Details

ABI Bytecode

Home state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >= 0.5.0 < 0.9.0;
4
5 contract local
6 {
7     string name="ravi"; //state
8     function store() pure public returns(uint)
9     {
10
11         uint age=11; //Local variable
12         return age;
13     }
14 }
```

↑ ↓ 0

listen on network

Q

Search with transaction hash or address

Constructor

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

Deploy

Publish to IPFS

OR

At Address Load contract from Address

Transactions recorded 2

Deployed Contracts

LOCAL AT 0xD91...39138 (MEMORY)

count

0: uint256: 0

Low level interactions

CALldata Transact

LOCAL AT 0xD8B...33FA8 (MEMORY)

listen on network Search with transaction hash or address

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >= 0.5.0 < 0.9.0;
contract local {
    uint public count;
    constructor() {
        count=8;
    }
}
```

Remix - Ethereum IDE x +

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js 2 tabs

DEPLOY & RUN TRANSACTIONS

Deployed Contracts

LOCAL AT 0xD91...39138 (MEMORY) Deploy x

count

0: uint256: 0

Low level interactions

CALldata

Transact

LOCAL AT 0xD8B...33FAB (MEMORY) Deploy x

count

0: uint256: 8

Low level interactions

CALldata

Transact

state.sol

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >= 0.5.0 < 0.9.0;
contract local {
    uint public count;
    constructor(uint new_count)
    {
        count=new_count;
    }
}
```

uint256 count 1 reference(s)

Search with transaction hash or address

listen on network

Constructor

- Executed only once.
- You can create only one constructor and that is optional.
- A default constructor is created by the compiler if there is no explicitly defined constructor.

Functions- Setters and Getters

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

getter

0: uint256: 10

Low level interactions

CALldata

Transact

LOCAL AT 0xD2A...FD005 (MEMORY)

setter

getter

0: uint256: 12

Low level interactions

CALldata

Transact

Home state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >= 0.5.0 < 0.9.0;
4
5 contract local
6 {
7     uint age=10;
8
9     function getter() public view returns(uint)
10    {
11         return age;
12     }
13
14     function setter(uint newage) public
15    {
16         age=newage;
17     }
18 }
```

The setter Costs Ethers while the getter not

ContractDefinition local 0 reference(s)

listen on network

Search with transaction hash or address

Functions

- When you call a setter function it creates a transaction that needs to be mined and costs gas because it changes the blockchain. Vice versa for getter function.
- When you declare a public state variable a getter function is automatically created.
- By default variable visibility is private.

View Vs Pure

Modifiers (Pure, view)

- Modifier change the behavior of functions
- Used to enforce access control
- Add conditions to function execution
- Perform pre- and post-processing
- Fundamental part of writing secure and efficient smart contracts

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

getter

0: uint256: 10

Low level interactions

CALldata

Transact

LOCAL AT 0xD8B...33FA8 (MEMORY)

age

getter

0: uint256: 100

Low level interactions

CALldata

Transact

state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >= 0.5.0 < 0.9.0;
4
5 contract local
6 {
7     uint public age=10;
8
9     function getter() public pure returns(uint)
10    {
11         uint roll=100;
12         return roll;
13     }
14 }
15
16 }
```

listen on network

Search with transaction hash or address

Integers

int

uint

Signed and unsigned integers can be of various sizes.

int8 to int256

uint8 to uint256

int alias to int256

uint alias to uint256

By default an int is initialized to 0. ↗

Overflow get detected at compile time.

Integers

<u>Range</u>	
int8 : - 128 to +127	uint8 : 0 to 255
int16 : - 32768 to +32767	uint16 : 0 to 65535
-$2^{(n-1)}$ to $2^{(n-1)}-1$	0 to 2^n-1

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

SOLIDITY COMPILER

EVM VERSION
compiler default

COMPILER CONFIGURATION
Auto compile
Enable optimization 200
Hide warnings

Compile state.sol

No Contract Compiled Yet

TypeError: Type int_const 256 is not implicitly convertible to expected type uint8. Literal is too large to fit in uint8. --> state.sol:7:14: | 7 | uint8 count=256;

state.sol:7:14: | 7 | uint8
count=256; | ^^^

state.sol

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >= 0.5.0 < 0.9.0;
contract local {
    uint8 count=256;
}
```

1 tabs

Integers

Operators:

- Comparisons: `<=`, `<`, `==`, `!=`, `>=`, `>` (evaluate to bool)
- Bit operators: `&`, `|`, `^` (bitwise exclusive or), `~` (bitwise negation)
- Arithmetic operators: `+`, `-`, unary `-`, unary `+`, `*`, `/`, `%` (remainder), `**` (exponentiation), `<<` (left shift), `>>` (right shift)

Integer Overflow (i.e., proxyOverflow Bug) Found in Multiple ERC20 Smart Contracts (CVE-2018-10376)

 PeckShield Apr 25, 2018 · 3 min read



Remix - Ethereum IDE New batchOverflow Bug in Multi... Integer Overflow (i.e., proxyOver... +

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.5.0+commit.1d4f565a.js

1 tabs

DEPLOY & RUN TRANSACTIONS

setter

Low level interactions

CALldata

Transact

LOCAL AT 0xD8B...33FA8 (MEMORY)

setter

money

0: uint8: 0

Low level interactions

CALldata

Transact

1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity **0.5.0;** **Solidity Version in 2018**
4
5 contract local
6 {
7 uint8 public money=255;
8
9 function setter() public
10 {
11 money=money+1;
12 }
13 }

listen on network

Search with transaction hash or address



DEPLOY & RUN TRANSACTIONS

Transact

LOCAL AT 0XDA0...42B53 (MEMORY)



setter

money

0: uint8: 0

Low level interactions

CALLDATA

Transact

state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity 0.5.0;
4
5
```

creation of local pending...

[vm] from: 0x5B3...eddC4
to: local.(constructor) value: 0 wei
data: 0x608...90029 logs: 0 hash: 0x22a...68b19

Debug

call to local.money

[call]

Remix - Ethereum IDE New batchOverflow Bug in Multi... Integer Overflow (i.e., proxyOver... +

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.0+commit.c7dfd78e.js

DEPLOY & RUN TRANSACTIONS

money

0: uint8: 0

Low level interactions

CALldata

Transact

LOCAL AT 0xD7A...F771B (MEMORY)

setter

money

0: uint8: 255

Low level interactions

CALldata

Transact

state.sol

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity 0.8.0;
contract local {
    uint8 public money=255;
    function setter() public {
        money=money+1;
    }
}
```

0 listen on network

Search with transaction hash or address

transact to local.setter pending ...

[vm] from: 0x5B3...eddC4 to: local.setter() 0xD7A...F771B value: 0 wei data: 0x3F3...108f7 logs: 0

hash: 0x69a...bdfcc

Debug

transact to local.setter errored: VM error: revert.

revert

The transaction has been reverted to the initial state.
Note: The called function should be payable if you send value and the value you send should be less than your current balance.
Debug the transaction to get more information.

Arrays

Fixed Size Array



Dynamic Size Array

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.0+commit.c7dfd78e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

Array - state.sol

Deploy

Publish to IPFS

OR

At Address Load contract from Address

Transactions recorded 1

Deployed Contracts

ARRAY AT 0xD91...39138 (MEMORY)

arr 3

0: uint256: 40

Low level interactions

CALldata

Transact

ContractDefinition Array → 0 reference(s) ↑ ↓

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.5.0 < 0.9.0;
contract Array {
    uint [4] public arr= [10,20,30,40,50];
}
```

listen on network

Search with transaction hash or address

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.0+commit.c7dfd78e.js

DEPLOY & RUN TRANSACTIONS

CALLEDATA

Transact

ARRAY AT 0xD6B...33FAB (MEMORY)

setter 3999

arr 3

0 uint256: 3999

Low level interactions

CALLEDATA

Transact

ARRAY AT 0x7EF...BCB47 (MEMORY)

setter uint256 index, uint256 value

arr uint256

length

0 uint256: 4

Low level interactions

CALLEDATA

Transact

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract Array
6 {
7     uint [4] public arr = [10,20,30,40];
8
9     function setter(uint index,uint value) public
10    {
11         arr[index]=value;
12     }
13     function length() public view returns(uint)
14    {
15         return arr.length;
16     }
17 }
```

listen on network

Search with transaction hash or address

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

1 tabs

DEPLOY & RUN TRANSACTIONS

ARRAY AT 0xD7A...F771B (MEMORY)

popElement

pushElement 30

arr 1

0: uint256: 20

len

0: uint256: 2

Low level interactions

CALLDATA

Transact

Dynamic Array

```
4 contract Array
5 {
6     uint[] public arr;
7
8     function pushElement(uint item) public
9     {
10        arr.push(item);
11    }
12
13     function len() public view returns(uint)
14     {
15        return arr.length;
16    }
17     function popElement() public
18     {
19        arr.pop();
20    }
21 }
```

FunctionDefinition

listen on network

Search with transaction hash or address

Byte Array

- 1 byte = 8 bits
- 1 hexadecimal digit = 4 bits
- Everything that will be stored in the byte array will be in the form of hexadecimal digits.

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.0+commit.c7dfd78e.js

1 tabs

DEPLOY & RUN TRANSACTIONS

At Address Load contract from Address

Transactions recorded 1

Deployed Contracts

ARRAY AT 0xD91...39138 (MEMORY)

- b2
 - 0: bytes2: 0x0000
- b3
 - 0: bytes3: 0x0000000

Low level interactions

CALldata

Transact

1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract Array
6 {
7 bytes3 public b3; //3 bytes array
8 bytes2 public b2; //2 bytes array
9 }

listen on network

Search with transaction hash or address

Remix - Ethereum IDE x ASCII Table - ASCII codes,hex,dec x +

← → ⌂ ↻ [rapidtables.com/code/text/ascii-table.html](https://www.rapidtables.com/code/text/ascii-table.html)

7 07 BEL 33 21 ! 59 3B ; 85 55 U 111 6F o
 8 08 BS 34 22 " 60 3C < 86 56 V 112 70 p
 9 09 HT 35 23 # 61 3D = 87 57 W 113 71 q
 10 0A LF 36 24 \$ 62 3E > 88 58 X 114 72 r
 11 0B VT 37 25 % 63 3F ? 89 59 Y 115 73 s
 12 0C FF 38 26 & 64 40 @ 90 5A Z 116 74 t
 13 0D CR 39 27 ' 65 41 A 91 5B [117 75 u
 14 0E SO 40 28 (66 42 B 92 5C \ 118 76 v
 15 0F SI 41 29) 67 43 C 93 5D] 119 77 w
 16 10 DLE 42 2A * 68 44 D 94 5E ^ 120 78 x
 17 11 DC1 43 2B + 69 45 E 95 5F _ 121 79 y
 18 12 DC2 44 2C , 70 46 F 96 60 ` 122 7A z
 19 13 DC3 45 2D - 71 47 G 97 61 a 123 7B {
 20 14 DC4 46 2E . 72 48 H 98 62 b 124 7C |
 21 15 NAK 47 2F / 73 49 I 99 63 c 125 7D }
 22 16 SYN 48 30 0 74 4A J 100 64 d 126 7E ~
 23 17 ETB 49 31 1 75 4B K 101 65 e 127 7F DEL
 24 18 CAN 50 32 2 76 4C L 102 66 f
 25 19 EM 51 33 3 77 4D M 103 67 g

ASCII,Hex,Dec,Bin,Base64 converter ►

Extended ASCII table

Character encoding

UTF-8 (Unicode)

128 80 □	154 9A □	180 B4 ' □	206 CE ï □	232 E8 è □
129 81 □	155 9B □	181 B5 .. □	207 CF ÿ □	233 EA á □

Remix - Ethereum IDE x ASCII Table - ASCII codes,hex,de... x +

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.0+commit.c7dfd78e.js

1 tabs

DEPLOY & RUN TRANSACTIONS

0: bytes3: 0x0000000

Low level interactions

CALldata

Transact

ARRAY AT 0xD8B...33FA8 (MEMORY)

setter

b2

b3

0: bytes3: 0x616263

Low level interactions

CALldata

Transact

state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract Array
6 {
7     bytes3 public b3; //3 bytes array
8     bytes2 public b2; //2 bytes array
9
10    function setter() public
11    {
12        b3='abc';
13        b2='ab';
14    }
15 }
```

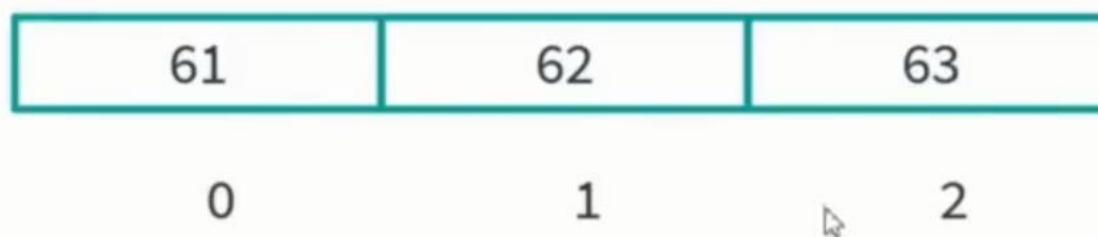
ContractDefinition Array → 0 reference(s) ^ ▾

listen on network

Search with transaction hash or address

Byte Array

```
bytes3 public b1= 'abc'
```



Deployed Contracts

FIXEDBYTEARRAY AT 0xC3B...AA

Balance: 0 ETH

setValueB1 "0x61"

setValueB2 "0x6162"

getB1

getB1At uint256 index

getB1Length

0: bytes2: 0x6162

getB2At uint256 index

getB2Length

Low-level interactions

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity ^0.8.0;
//pragma solidity 0.5.0;

contract FixedByteArray
{
    bytes1 b1 = "A";
    bytes2 b2 = "A";

    function setValueB1(bytes1 _b1) public {
        b1 = _b1;
    }

    function setValueB2(bytes2 _b2) public {
        b2 = _b2;
    }

    function getB1() public view returns(bytes1){
        return b1;
    }

    function getB1At(uint index) public view returns(bytes1){
        return b1[index];
    }
}
```

0 listen on all transactions Search with transaction hash or address

[vm] **from:** 0xb3...edd04 **to:** FixedByteArray.setValueB2(bytes2) 0xc3b...aae0a **value:** 0 wei **data:** 0xe6...00000 **logs:** 0
hash: 0x213...1f9d4
call to FixedByteArray.getB2

Remix - Ethereum IDE x ASCII Table - ASCII codes,hex,de... x | +

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.0+commit.c7dfd78e.js

DEPLOY & RUN TRANSACTIONS

ARRAY AT 0xD88...33FAB (MEMORY)

setter

b2

0: bytes2: 0x6162

b3

0: bytes3: 0x616263

Low level interactions

CALLDATA

Transact

ARRAY AT 0xD7A...F771B (MEMORY)

setter

b2

0: bytes2: 0x6100

b3

Low level interactions

CALLDATA

Transact

state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract Array
6{
7    bytes3 public b3; //3 bytes array
8    bytes2 public b2; //2 bytes array
9
10   function setter() public
11  {
12      b3='abc';
13      b3[0]='d';
14  }
15 }
```

TypeError: Single bytes in fixed bytes arrays cannot be modified.

--> state.sol:13:6:

13 | b3[0]='d';
| ^^^^^^

listen on network. Search with transaction hash or address

Byte Array

- Byte arrays cannot be modified.
- Padding of 0 is added at the end if the value(by which the array is initialized) does not occupy the entire space.



Byte Array

Fixed-Size array

- bytes1,bytes2,bytes3 bytes32.

Dynamic Size array

- bytes which is shorthand for bytes[]



DEPLOY & RUN TRANSACTIONS

Home state.sol X

getElement 1

0: bytes1 0x62

Low level interactions

CALldata

Transact

ARRAY AT 0X7EF_8CB47 (MEMORY)

pushElement

b1

getElement

uint256 i

getlength

Low level interactions

CALldata

Transact

```

1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract Array
6 {
7     bytes public b1="abc";
8
9     function pushElement() public
10 {
11     b1.push('d');
12 }
13
14 function getElement(uint i) public view returns(bytes1)
15 {
16     return b1[i];
17 }
18
19 function getlength() public view returns(uint)
20 {
21     return b1.length;
22 }

```

ContractDefinition Array 0 reference(s) ▾



listen on network



Search with transaction hash or address

Loops

while

for

do-while

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

DEPLOY & RUN TRANSACTIONS

At Address Load contract from Address

Transactions recorded 3

Deployed Contracts

ARRAY AT 0XDA0...42B53 (MEMORY)

arr 1

0: uint256 0

Low level interactions

CALldata

Transact

ARRAY AT 0X358...D3EE3 (MEMORY)

loop

arr 2

0: uint256 2

count

0: uint256 0

Low level interactions

CALldata

Transact

state.sol

Home

90%

- + Reset

2 tabs

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.5.0 < 0.9.0;
contract Array {
    uint[3] public arr;
    uint public count;
    function loop() public{
        while(count<arr.length){
            arr[count]=count;
            count++;
        }
    }
}
```

- Solidity doesn't have built-in features for printing values to the console.
- Code executes on the Ethereum blockchain, and it doesn't have direct access to the standard output
- You cannot use functions like `console.log`, `print()`, or `cout`.
- You can return values from functions when you interact with the contract through `web3.js` or `ethers.js` in your client-side code

ContractDefinition Array 0 reference(s)

listen on network

Search with transaction hash or address

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

DEPLOY & RUN TRANSACTIONS

ARRAY AT 0x358..D5EE3 [MEMORY]

loop

arr 2

0 uint256 2

count

0 uint256 0

Low level interactions

CALldata

Transact

ARRAY AT 0xD2A..FD005 [MEMORY]

loop

arr uint256

0 uint256 1

count

0 uint256 0

Low level interactions

CALldata

Transact

Home state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract Array
6 {
7     uint[3] public arr;
8     uint public count;
9
10 function loop() public{
11     for(uint i=count;i<arr.length;i++)
12     {
13         arr[count]=count;
14         count++;
15     }
16 }
17 }
```

uint256 count ↗ 4 reference(s) ▾

listen on network

Search with transaction hash or address

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

arr 1
0: uint256: 1

count
0: uint256: 3

Low level interactions

CALldata

Transact

ARRAY AT 0X0FC_9A836 [MEMORY]

loop

arr uint256
count

Low level interactions

CALldata

Transact

```
1 // SPDX-License-Identifier: MIT
2
3 contract Array {
4
5     uint[3] public arr;
6     uint public count;
7
8     function loop() public{
9
10        do{
11            arr[count]=count;
12            count++;
13        }while(count<arr.length);
14    }
15 }
```

uint256 count ↗ 4 reference(s) ^

listen on network

Search with transaction hash or address

If-else



The screenshot shows the Truffle IDE interface with the following details:

- Top Bar:** Shows the file name "state.sol" and the commit hash "commit.11564f7e.js".
- Left Sidebar (Deploy & Run Transactions):**
 - GAS LIMIT: Set to 3000000.
 - VALUE: Set to 0.
 - CONTRACT: Set to "Array - state.sol".
 - Buttons: Deploy, Publish to IPFS, At Address, Load contract from Address.
 - Transactions recorded: 1.
 - Deployed Contracts: ARRAY AT 0X9D8...A5692 (MEMORY).
 - Call Data: check (-5). Options: 0: string: less than zero.
 - Low level interactions: CALDATA.
- Code Editor:** Displays the Solidity code for the "check" function.

```
7 function check(int a) public pure returns(string memory)
8 {
9     string memory value;
10
11    if(a>0)
12    {
13        value="greater than zero";
14    }
15    else if(a==0)
16    {
17        value="equal to zero";
18    }
19    else
20    {
21        value="less than zero";
22    }
23    return value;
```
- Bottom Bar:** Includes icons for Home, search, and transaction status (0), and a "listen on network" button.
- Bottom Right:** A search bar with placeholder text "Search with transaction hash or address".

Booleans

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

VALUE
0 wei

CONTRACT
Array - state.sol

Deploy

Publish to IPFS

OR

At Address Load contract from Address

Transactions recorded 1

Deployed Contracts

ARRAY AT 0x5FD...9D88D (MEMORY)

value

Low level interactions

CALDATA

Transact

Home state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract Array
6 {
7     bool public value=true;
8
9 }
10
```

listen on network

Search with transaction hash or address

Booleans

- `bool`: The possible values are constants `true` and `false`.

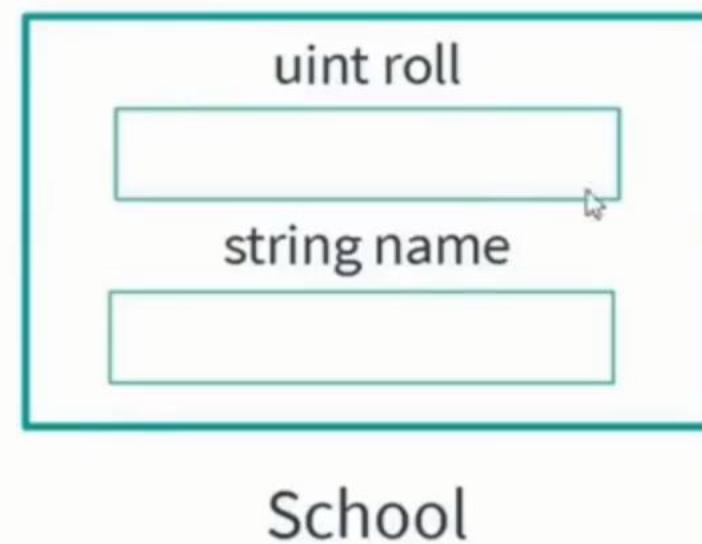
Operators:

- `!` (logical negation)
- `&&` (logical conjunction, “and”)
- `||` (logical disjunction, “or”)
- `==` (equality)
- `!=` (inequality)



Struct

```
struct school  
{  
    uint roll;  
    string name;  
}
```



Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

3 tabs

DEPLOY & RUN TRANSACTIONS

0 wei CONTRACT Demo - state.sol Deploy 1. Ravi Publish to IPFS OR At Address Load contract from Address Transactions recorded 2 Deployed Contracts DEMO AT 0xD91...39138 (MEMORY)

s1

0: uint256: roll 1
1: string: name Ravi

Low level interactions CALDATA Transact

DEMOS AT 0XD6B...33FA8 (MEMORY)

```
pragma solidity >=0.5.0 < 0.9.0;

struct Student{
    uint roll;
    string name;
}

contract Demo
{
    Student public s1;

    constructor(uint _roll,string memory _name)
    {
        s1.roll = _roll;
        s1.name=_name;
    }

    function change(uint _roll, string memory _name) public
    {
        Student memory new_student=Student({
            roll:_roll,
            name:_name
        });

        s1=new_student;
    }
}
```

ContractDefinition Academy 0 reference(s)

Type here to search

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

1 tabs

DEPLOY & RUN TRANSACTIONS

Transactions recorded 5

Deployed Contracts

STATE AT 0XB27_07C2C (MEMORY)

- u1
 - 0: uint8 0

Low level interactions

CALldata

Transact

STATE AT 0XCD6_99DF9 (MEMORY)

Low level interactions

CALldata

Transact

STATE AT 0XAEO_9688B (MEMORY)

- u1
 - 0: uint8 2

Low level interactions

CALldata

Transact

```
state.sol
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract State
6 {
7     enum user{allowed,not_allowed,wait}
8
9     user public u1= user.allowed;
10    uint public lottery=1000;
11    function owner() public {
12        if(u1==user.allowed)
13        {
14            lottery=0;
15        }
16    }
17
18    function changeOwner() public{
19        u1=user.not_allowed;
20    }
21 }
22
```

ContractDefinition State 0 reference(s)

listen on network

Search with transaction hash or address

Mapping

- Concept of keys and values.
- mapping(key=>value)



Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

DEPLOY & RUN TRANSACTIONS

Deploy

Publish to IPFS

OR

At Address Load contract from Address

Transactions recorded 4

Deployed Contracts

DEMO AT 0xD91...39138 (MEMORY)

setter 2,"reena"

roll_no 2

0: string: reena

Low level interactions

CALldata

Transact

Home state.sol

125%

1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4 contract demo
5 {
6 mapping(uint=>string) public roll_no;
7
8 function setter(uint keys,string memory value) public
9 {
10 roll_no[keys]=value;
11 }
12 }
13
14 |

listen on network

Search with transaction hash or address

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

FILE EXPLORERS

Workspaces default_workspace

- contracts
- scripts
- tests
- College
- artifacts
- README.txt
- Lottery.sol
- state.sol

Home state.sol

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.5.0 < 0.9.0;
4 contract demo
5 {
6     struct Student{
7         string name;
8         uint class;
9     }
10    mapping(uint=>Student) public data;
11
12    function setter(uint _roll,string memory _name ,uint _class) public
13    {
14        data[_roll]= Student(_name,_class);
15    }
16 }
17
18 |
```

listen on network

Search with transaction hash or address

Mapping

- The key cannot be types mapping ,dynamic array ,enum and struct.
- The values can be of any type.
- Mappings are always stored in storage irrespective of whether they are declared in contract storage or not.

Storage Vs Memory

Storage	Memory
Holds state variables.	Holds local variables defined inside functions if they are reference types.
Persistent	Not persistent
Cost gas	No gas
Like a computer HDD	Like a computer RAM

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

Transactions recorded 2

Deployed Contracts

DEMO AT 0XDDA...5482D (MEMORY)

sto

mem

student 0

0: string: Akash

Low level interactions

CALldata

Transact

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.5.0 < 0.9.0;

contract demo
{
    string[] public student=['Ravi','Rita','Aman'];

    function mem() public view
    {
        string[] memory s1=student;
        s1[0]='Akash';
    }

    function sto() public
    {
        string[] storage s1=student;
        s1[0]='Akash';
    }
}
```

listen on network

Search with transaction hash or address

Storage Vs Memory

```
string[] public student =['Ravi', 'Rita', 'Aman'];
```

Ravi	Rita	Aman
0	1	2

```
string[] memory s1=student;
```

Akash	Rita	Aman
0	1	2

```
s1[0]='Akash';
```

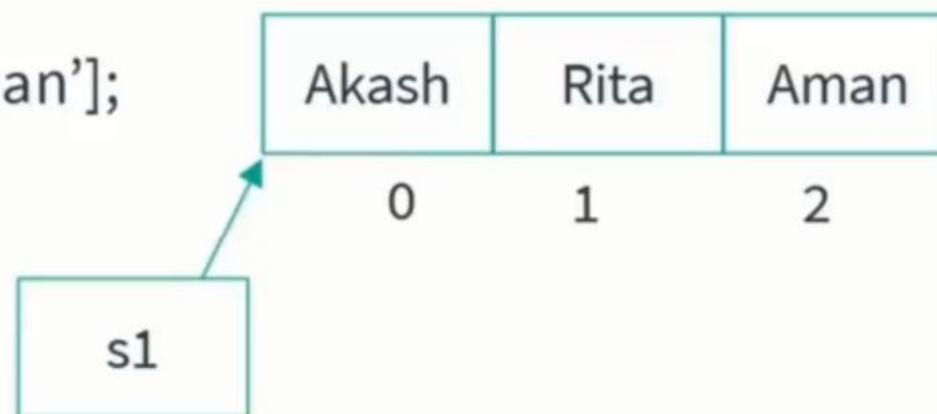
Storage Vs Memory

```
string[] public student =['Ravi', 'Rita', 'Aman'];
string[] memory s1=student;
s1[0]='Akash';
```

Ravi	Rita	Aman
0	1	2

Akash	Rita	Aman
0	1	2

```
string[] public student =['Ravi', 'Rita', 'Aman'];
string[] storage s1=student;
s1[0]='Akash';
```



Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

Global Variables in Solidity

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.5.0 < 0.9.0;
contract demo {
    function getter() public view returns(uint block_no,uint timestamp,address msgSender)
    {
        return(block.number,block.timestamp,msg.sender);
    }
}
```

DEPLOY & RUN TRANSACTIONS

VALUE: 0 wei

CONTRACT: demo - state.sol

Deploy

Publish to IPFS

OR

At Address Load contract from Address

Transactions recorded 1

Deployed Contracts

DEMO AT 0xD91...39138 (MEMORY)

getter

0: uint256: block_no 1
1: uint256: timestamp 1627580751
2: address: msgSender 0x5B38Da6a701c568545dCtCB03FcB875f56beddC4

Low level interactions

CALldata

Transact

listen on network

Search with transaction hash or address

Pause (F10)

Contract Balance

Transfer and get Ethers

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT

JavaScript VM (Berlin)

ACCOUNT

0xAb8...35cb2 (100 ether)

GAS LIMIT

3000000

VALUE

0 ether

CONTRACT

pay - state.sol

Deploy

Publish to IPFS

OR

At Address Load contract from Address

Transactions recorded 0

Execution cost: 120 gas FunctionDefinition payEther 0 reference(s)

listen on network

Search with transaction hash or address

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.5.0 < 0.9.0;
contract pay {
    function payEther() public payable
}
```

Simply this method is enough for transferring ethers

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT: JavaScript VM (Berlin)

ACCOUNT: 0xCA3...a733c (101 ether) : 0x4B2...C02db (96.999999999999791227 ether)

At Address Load contract from Address

Transactions recorded: 3

Deployed Contracts: PAY AT 0XSEC...DDEB4 (MEMORY)

FunctionDefinition

```
// SPDX-License-Identifier: GPL-3.0
pragma solidity >=0.5.0 < 0.9.0;
contract pay {
    address payable user=payable(0xCA35b7d915458EF540aDe6068dFe2F44E8fa733c);
    function payEther() public payable
    {
    }
    function getBalance() public view returns(uint)
    {
        return address(this).balance;
    }
    function sendEtherAccount() public
    {
        user.transfer(1 ether);
    }
}
```

listen on network

Search with transaction hash or address

Inheritance vs Composition

Inheritance:

- Inheritance is like a parent-child relationship.
- It allows a new contract (**child**) to inherit properties and methods from an existing contract (**parent**).
- Provides a way to create a "is-a" relationship.
- Used for sharing common code and state variables.

Composition:

- Composition is like assembling components.
- It involves creating a contract that is composed of other contracts as components.
- Useful for creating a "has-a" relationship
- Used to combine various functionalities.

Virtual vs Override keyword

Virtual:

- Used in a base contract's function to indicate that the function can be overridden by derived contracts.
- Allows derived contracts to provide their own implementation of the function.

Override:

- Used in a derived contract's function to indicate that the function is intended to replace or override a function with the same name from a base contract.
- Ensure that the function in the derived contract is used to override the base function.

Visibility

Public	Private	Internal	External
Outside	x	x	Outside
Within	Within	Within	x
Derived	x	Derived	x
Other	x	x	Other



Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

FILE EXPLORERS

Workspaces default_workspace

- contracts
- scripts
- tests
- College
- artifacts

README.txt

Lottery.sol

state.sol

```
2
3 pragma solidity >=0.5.0 < 0.9.0;
4
5 contract A {
6
7     function f1() public pure returns(uint)
8    {
9         return 1;
10    }
11    function f2() private pure returns(uint)
12    {
13        return 2;
14    }
15
16    function f3() internal pure returns(uint)
17    {
18        return 3;
19    }
20    function f4() external pure returns(uint)
21    {
22        return 4;
23    }
24
25 }
26
27
```

ContractDefinition B ↗ 0 reference(s) ▾

listen on network

Search with transaction hash or address

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

state.sol

Deploy

Publish to IPFS

OR

At Address Load contract from Address

Transactions recorded 1

Deployed Contracts

A AT 0xD91...39138 (MEMORY)

f1

f4

Low level interactions

CALldata

Transact

```
5 // contract A {
6
7     function f1() public pure returns(uint)
8     {
9         return 1;
10    }
11    function f2() private pure returns(uint)
12    {
13        return 2;
14    }
15
16    function f3() internal pure returns(uint)
17    {
18        uint x=f4();
19        return 3;
20    }
21    function f4() external pure returns(uint)
22    {
23        return 4;
24    }
}
```

listen on network

Search with transaction hash or address

DEPLOY & RUN TRANSACTIONS

JavaScript VM (Berlin)

On-Site

A - state.sol

Page 1

1

Transactions recorded

Deployed Contracts

LOW LEVEL INFRASOUNDS

```
5*contract A {
6
7 function f1() public pure returns(uint)
8*{
9     return 1;
10}
11function f2() private pure returns(uint)
12*{
13    return 2;
14}
15
16function f3() internal pure returns(uint)
17*{
18
19    return 3;
20}
21function f4() external pure returns(uint)
22*{
23    return 4;
24}
25
26}
27contract B is A
28*{
29    uint public bx=f3();
30}
31
```

⚠ compilerMetadata is modifying/artifacts/B/json ✘ json ✘

Execution cost: 315 gas FunctionDefinition f1 ↗ 1 reference(s) ↘

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

2 tabs

DEPLOY & RUN TRANSACTIONS

f1
f4

Low level interactions
CALLDATA
Transact

B AT 0xD8B_33FA8 (MEMORY)

bx
0: uint256: 3

f1
f4

Low level interactions
CALLDATA
Transact

```
Home state.sol
1
2
3     return 2;
4 }
5
6 function f3() internal pure returns(uint)
7 {
8
9     return 3;
10 }
11 function f4() external pure returns(uint)
12 {
13     return 4;
14 }
15
16 contract B is A
17 {
18     uint public bx=f4();
19 }
20
21
22
23
24
25
26
27
28
29
30
31
```

Execution cost: infinite gas FunctionDefinition f3 1 reference(s)

listen on network

Search with transaction hash or address

Remix - Ethereum IDE

remix.ethereum.org/#optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.6+commit.11564f7e.js

DEPLOY & RUN TRANSACTIONS

CONTRACT
A - state.sol

Deploy

Publish to IPFS

OR

At 0x... Load contract from address

Transactions recorded

Deployed Contracts

A AT 0x00 (MEMORY)

Low level interactions

CALLDATA

Trusted

B AT 0x00 (MEMORY)

Low level interactions

CALLDATA

Trusted

```
6
7 function f1() public pure returns(uint)
8{
9    return 1;
10}
11 function f2() private pure returns(uint)
12{
13    return 2;
14}
15
16 function f3() internal pure returns(uint)
17{
18
19    return 3;
20}
21 function f4() external pure returns(uint)
22{
23    return 4;
24}
25
26}
27 contract C
28{
29    A obj= new A();
30    uint public cx=obj.f4();
31}
```

compilerMetadata is modifying artifacts/C.json

ContractDefinition B 0 reference(s)