

Exercises

Development

Solidity Mappings & Structures

DE Solidity

Student In

coursehero.com/posts/code/102/Solidity-Mappings-&-Structures...

☆

https://npub3.npub.ee...

A struct in solidity is just a custom type that you can define. You define the struct with a name and associated properties inside of it.

Start a new file in the **Remix IDE** called Courses.sol and paste the following:

```
pragma solidity ^0.4.18;

contract Courses {

    struct Instructor {
        uint age;
        string fName;
        string lName;
    }

}
```

Here, we have a struct of Instructor, which will store their name, first name and last name.

It would also be handy if we could reference each instructor by their Ethereum address. That's where we'll create a mapping.

Creating the Mapping

In Solidity, a mapping is referred to a hash table, which consists of key types and value type pairs. We define a mapping like any other variable type:

```
contract Courses {

    struct Instructor {
        uint age;
        string fName;
        string lName;
    }

    mapping(address => Instructor) instructors;
    address[] public instructorAccts;
```

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    struct Instructor {
        uint age;
        string fName;
        string lName;
    }

    mapping(address => Instructor) instructors;
    address[] public instructorAccts;
```

Here, we're creating a mapping, which accepts first the key type (in our case, it will be an address type), and the value type will be our Struct that we created above, then we're referring to this mapping as instructors.

This will allow us to look up a specific instructor with their Ethereum address, and retrieve their age, first name and last name.

Remix - Ethereum IDE

Not secure | remix.ethereum.org/#optimize=false&evmVersi...

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browsers/Courseto.sol browsers/Courses

Compile Run Analysis Testing Debugger Settings

pragma solidity ^0.4.18;
contract Courses {
 struct Instructor {
 uint age;
 string fName;
 string lName;
 }
}

config

Environment Web3 ProviderCustom (1586197159513)
Account 0xc48...4c9be (100 ether)
Gas limit 3000000
Value 0 wei

No compiled contracts or
AI Address Load contract from Address

Transactions recorded: 0

Deployed Contracts
Currently you have no contract instances to interact with.

[?] only remix transactions, scrip

Welcome to Remix v0.7.7 -
You can use this terminal for:
• Checking transactions details and start debugging.
• Running JavaScript scripts. The following libraries are accessible:
 • web3 version 1.0.0
 • ethers.js
 • browserify
 • compilers - contains currently loaded compiler
• Executing common command to interact with the Remix interface (see list of commands above). Note that these commands can also be included and run from a JavaScript script.
• Use exports.register(key, obj)/remove(key)/clear() to register and reuse object across script executions.

Adding to a Mapping

Being that our smart contract structure is now significantly different from the previous contract, let's examine what it takes to add a instructor to this new format:

```
// Previous code removed for brevity

function setInstructor(address _address, uint _age, string _fName, string _lName) public {
    var instructor = instructors[_address];
    // ...
    instructor.age = _age;
    instructor.fName = _fName;
    instructor.lName = _lName;
    instructorAccts.push(_address) ->;
}
```

In the arguments, we're passing an address, age, first name and last name; simple enough.

Next, we're creating a variable **instructor** and binding it to the **instructors** mapping and passing in the **_address** as the key.

We then set the age, first and last name.

At the end, we push the new instructor address to the array of addresses **instructorAccts**.

Getting from a Mapping

We can now add new instructors to our mapping, but what if we wanted to retrieve them? Well, first we'll create a function that returns a list of addresses from **instructorAccts**:

```
// Other code removed for brevity

function getInstructors() view public returns (address[]) {
    return instructorAccts;
}
```

Next, we're creating a variable **instructor** and binding it to the **instructors** mapping and passing in the **_address** as the key.

We then set the age, first and last name.

At the end, we push the new instructor address to the array of addresses **instructorAccts**.

Getting from a Mapping

We can now add new instructors to our mapping, but what if we wanted to retrieve them? Well, first we'll create a function that returns a list of addresses from **instructorAccts**:

```
function getInstructors() view public returns (address[]) {
    return instructorAccts;
}
```

Great. Now that we have access to specific accounts, we can create another function beneath it that will retrieve a specific instructor based on a provided address:

```
function getInstructor(address _ins) view public returns (uint, string, string) {
    return (instructors[_ins].age, instructors[_ins].fName, instructors[_ins].lName);
}
```

The screenshot shows the Remix IDE interface. The left pane displays the smart contract code for **CourseSet.sol**. The right pane shows the **Environment** panel with the following details:

- Environment:** Web3 Provider: Custom (1586197159513)
- Account:** 0xc48...4c98e (100 ether)
- Gas limit:** 3000000
- Value:** 0 wei

The **Compiler** panel shows the Solidity version as **0.4.18**. The **Console** panel displays the output of the **setInstructor** function, showing the address of the newly added instructor.

The screenshot shows the Remix IDE interface. The main editor displays a Solidity contract named `Courses.sol` with the following code:

```

1 pragma solidity ^0.4.18;
2
3 contract Courses {
4     struct Instructor {
5         uint age;
6         string fName;
7         string lName;
8     }
9
10    mapping(address => Instructor) instructors;
11    address[] public instructorAccts;
12
13    function setInstructor(address _address, uint _age, string _fName, string _lName) public {
14        var instructor = instructors[_address];
15
16        instructor.age = _age;
17        instructor.fName = _fName;
18        instructor.lName = _lName;
19        instructorAccts.push(_address) -1;
20    }
21
22    function getInstructors() view public returns (address[]) {
23        return instructorAccts;
24    }
25 }

```

The right sidebar shows the environment settings (Web3 Provider: Custom, Account: 0xc48...4c98e) and a list of deployed contracts. The bottom panel shows the transaction details for the deployment:

status	1
transaction hash	0xb633c66b2ace61132777c24fa3b531c0b963d1958b0b0e4d642093b40
from	0xc48258739a9751d0f6e5825d8b8913a614c98e
to	Courses (constructor) 0xb0
gas	376124 gas
transaction cost	376124 gas
hash	0xb633c66b2ace61132777c24fa3b531c0b963d1958b0b0e4d642093b40
input	0x000...20029
decoded input	()
decoded output	-
logs	()

"from address", 34, "Gary", "Simon"

The screenshot shows a YouTube video player with the title "06. Solidity Mappings & Structs Tutorial" by DesignCourse. The video is at 8:05 / 12:01. The video content shows a Remix IDE interface with the same Solidity contract as above. The right sidebar shows the environment settings and a list of deployed contracts. The bottom panel shows the transaction details for the deployment:

status	1
transaction hash	0xb633c66b2ace61132777c24fa3b531c0b963d1958b0b0e4d642093b40
from	0xc48258739a9751d0f6e5825d8b8913a614c98e
to	Courses (constructor) 0xb0
gas	376124 gas
transaction cost	376124 gas
hash	0xb633c66b2ace61132777c24fa3b531c0b963d1958b0b0e4d642093b40
input	0x000...20029
decoded input	()
decoded output	-
logs	()

```

contract Courses {
    struct Instructor {
        uint age;
        string fName;
        string lName;
    }

    // Mapping Instructor struct to an Ethereum address.
    mapping (address => Instructor) instructors;
    address[] public instructorAccts;

    function setInstructor(address _address, uint _age, string _fName, string _lName) public {
        var instructor = instructors[_address];

        instructor.age = _age;
        instructor.fName = _fName;
        instructor.lName = _lName;

        instructorAccts.push(_address) -1;

        // Return a list of addresses from instructorAccts
        function getInstructors() view public returns(address[]) {
            return instructorAccts;
        }

        // Retrieve a specific instructor based on a provided address
        function getInstructor(address _address) view public returns (uint, string, string) {
            return (instructors[_address].age, instructors[_address].fName, instructors[_address].lName);
        }

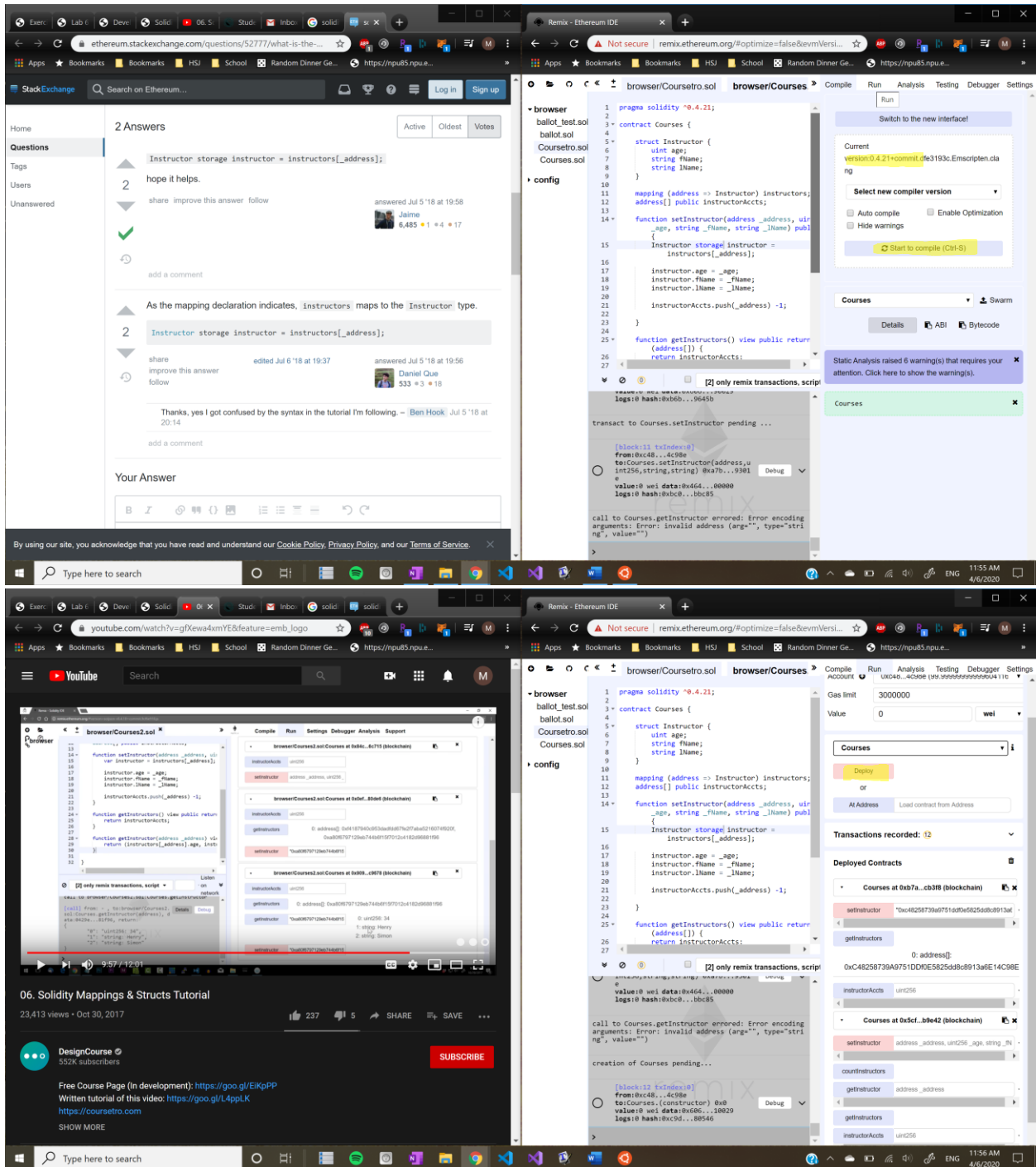
        // Count how many instructors
        function countInstructors() view public returns (uint) {
            return instructorAccts.length;
        }
    }
}

```

• Step 0: Overview

- This lab will **complete revamp the smart contract**, our UI will no longer work.
- What is next after this lab
 - To learn how you can **make payments to other accounts**.
 - To make our UI work with this **new contract**.

• Step 1: Creating a Struct



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browser/Coursetro.sol

browser/Courses

Compile

Run

Analysis

Testing

Debugger

Settings

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pragma solidity ^0.4.21;

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contract Courses {

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Written tutorial of this video: <https://goo.gl/L4pLK>
<https://coursetro.com>

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Remix - Ethereum IDE

browser/Coursetro.sol

```
15  _age, string _fName, string _lName) public {
16      Instructor storage instructor =
17          Instructor[_age][_fName][_lName];
18      instructor.age = _age;
19      instructor.fName = _fName;
20      instructor.lName = _lName;
21      instructorAccts.push(_address);
22  }
23
24  function getInstructors() view public returns(address[]) {
25      return instructorAccts;
26  }
27
28  function getInstructor(address _address) view public returns (
29      uint, string, string) {
30      return (instructorAccts[_address].age, instructorAccts[_address].fName,
31             instructorAccts[_address].lName);
32  }
33
34  function countInstructors() view public
35      returns (uint) {
36      return instructorAccts.length;
37  }
```

call to Courses.getInstructor

[call] From: 0xc48258739a9751d0f6e5825d8b8913ae to: Courses.getInstructor(address) data: 0x042...4c98e

call to Courses.countInstructors

[call] From: 0xc48258739a9751d0f6e5825d8b8913ae to: Courses.countInstructors() data: 0xcab...ab933

Transactions recorded: 0

Deployed Contracts

Courses at 0xb7a...cb3f8 (blockchain)

getInstructor

0: address: 0xc48258739a9751d0f6e5825d8b8913ae

instructorAccts

uint256

Courses at 0x798...d41ae (blockchain)

getInstructor

0: address: 0xc48258739a9751d0f6e5825d8b8913ae

instructorAccts

uint256

countInstructors

0: uint256: 1

getInstructor

0: address: 0xc48258739a9751d0f6e5825d8b8913ae

instructorAccts

uint256

1: string: Gary
2: string: Simons