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Group Project: Smart Contracts
Tuition Fee

Cedric Schröter, Philip Steiger und Jonas Löffler 10.12.18

Background & Idea 1/2

1. **Main essence of smart contracts:** Transaction consensus

1. **Disrupt the fixed tuition based university systems**
   - Free entry, no tuition payable up front
   - Tuition payment is based on in-class performance of professors
   - Incentive based payment system
     - 50% goes to professor
     - 40% university
     - 10% best professor
   - We ignore any game theoretical implications

3. **Problem**: Universities may give false information about incoming fees
4. **Solution**: Smart contracts and consensus

Background & Idea 2/2

5. **Students pay tuition through smart contract**
   - Accessible for professors and students
   - Code is law

6. **Course List**
   - `addclass('0x545c2Fbd2eca50dD9510482B57aB05FB709232a5  ', "Bitcoin, Blockchain and Kryptoassets – Fabian Schär");`
   - `addclass('0xd0c5d178a1b4174799eE0E17129B0dE413394903 ', "Blockchain, Consensus Protocols and Smart Contracts – Alexander Berentsen");`

7. **The Code**

Code 1/3

```
pragma solidity ^0.4.24;

contract TuitionFee {
```

Declare state variables

```
        using SafeMath for uint256;
        uint public endTime;
        address public owner;
        bool public active = true;
        mapping (bytes32 => uint) public courselistMapping;

        struct CourseList {
            uint amount;
            address addr;
            bytes32 title;
        }
```

Define modifiers

```
        CourseList[] public courselists;

        modifier notEnded() { require(true == active); _; }
```

Define events

```
           event Pay(address indexed _from, uint256 indexed _courselist);
        event Ended();

           constructor(uint end) public {
            endTime = end;
            owner = msg.sender;
           }
```

Code 2/3

Add Address

Pay

```
function add(address addr, bytes32 title) public notEnded returns(uint) {
    require(owner == msg.sender);
    uint index = courselists.length;
    courselistMapping[title] = index;
    courselists.push(CourseList({
        amount: 0,
        addr: addr,
        title: title
    }));
    return index;
}


   function pay(uint courselist) public notEnded payable {
           courselists[courselist].amount += msg.value;
    emit Pay(msg.sender, courselist);
   }
```

End

```
function end() notEnded public {
    require(now > endTime);
    uint max = 0;
    address winnerAddress;
    uint balance = address(this).balance;
    owner.transfer(balance.mul(20).div(100));
    for (uint i = 0; i < courselists.length; i++) {
        if (courselists[i].amount > max) {
            max = courselists[i].amount;
            winnerAddress = courselists[i].addr;
        }
        courselists[i].addr.transfer(courselists[i].amount.mul(70).div(100));
    }
    winnerAddress.transfer(address(this).balance);
    active = false;
    emit Ended();
```

Code 3/3

Implement a library

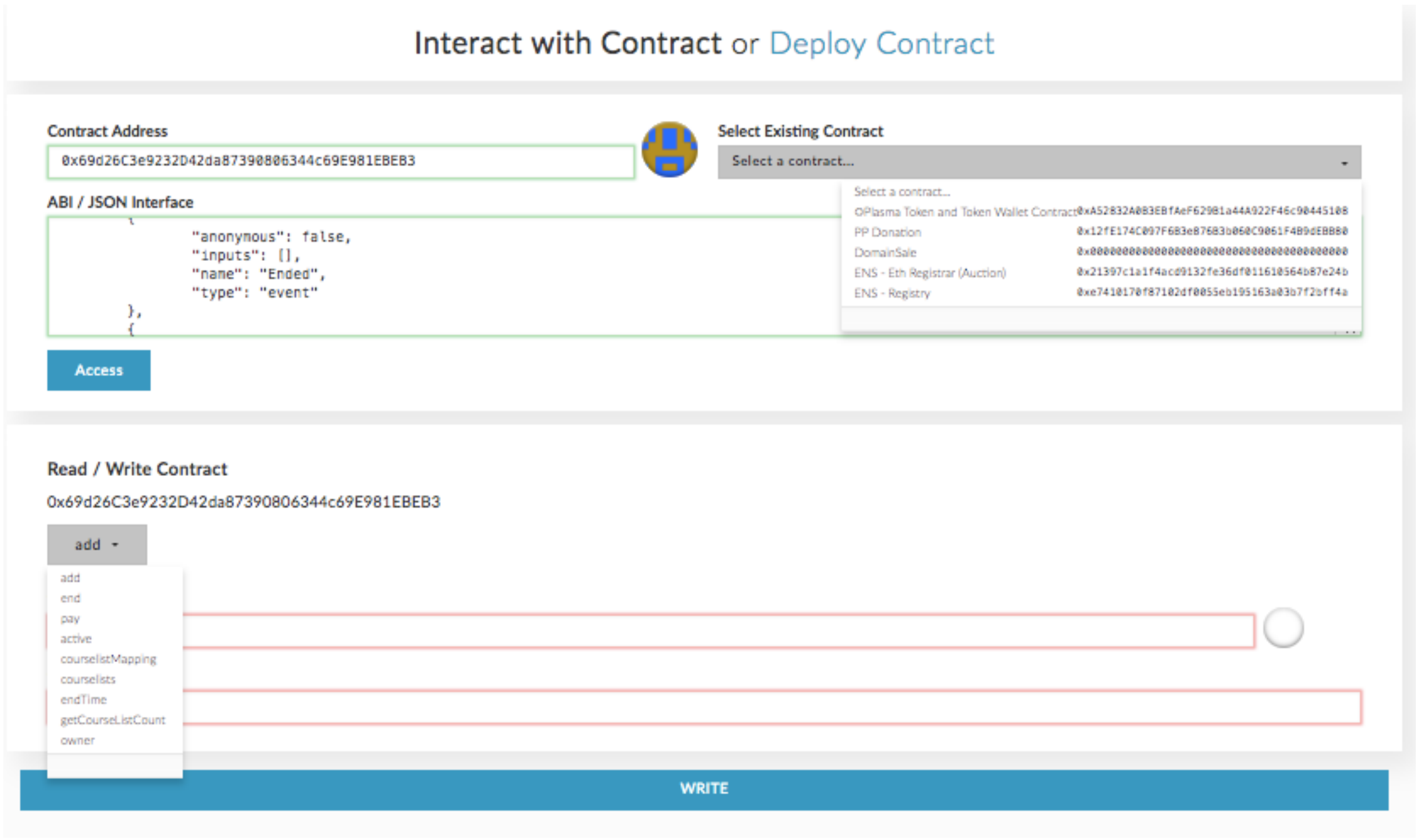
```
library SafeMath {
  function mul(uint256 a, uint256 b) internal pure returns (uint256) {
    uint256 c = a * b;
    assert(a == 0 || c / a == b);
    return c;
  }

  function div(uint256 a, uint256 b) internal pure returns (uint256) {
    // assert(b > 0); // Solidity automatically throws when dividing by 0
    uint256 c = a / b;
    // assert(a == b * c + a % b); // There is no case in which this doesn't hold
    return c;
  }

  function sub(uint256 a, uint256 b) internal pure returns (uint256) {
    assert(b <= a);
    return a - b;
  }

  function add(uint256 a, uint256 b) internal pure returns (uint256) {
    uint256 c = a + b;
    assert(c >= a);
    return c;
  }
}
```

Deployment and Interaction



Interact with Contract or Deploy Contract

Contract Address

0x69d26C3e9232D42da87390806344c69E981EBEB3

Select Existing Contract

Select a contract...

Select a contract...	
OPlasma Token and Token Wallet Contract	0xA52832A0B3EBfAeF629B1a44A922F46c90445108
PP Donation	0x12fE174C097F6B3e87683b060C9061F4B9dEBBB0
DomainSale	0x0000000000000000000000000000000000000000
ENS - Eth Registrar (Auction)	0x21397c1a1f4acd9132fe36df011610564b87e24b
ENS - Registry	0xe7410170f87102df0055eb195163a03b7f2bff4a

ABI / JSON Interface

```
        {
                "anonymous": false,
                "inputs": [],
                "name": "Ended",
                "type": "event"
        },
        {
```

Read / Write Contract

0x69d26C3e9232D42da87390806344c69E981EBEB3

Source: https://github.com/trapp/smart-contract-intro *(Trapp, 08.12.2018)*

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Conclusion

”Economists are best in finding specialists to get the job done.” (Berentsen, 2018)

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Thank you
for your attention.