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Angular DApps on the Ethereum Blockchain


soft aware
Aware of your ideas.
Developing your software.

It’s all about the

~~Blockchain~~

It’s all about

~~Ethereum~~

It’s all about

DApps

What's a DApp? | Decentralized App

...from a software developer's point of view

A „program" (smart contract) running on the blockchain combined with a user interface (frontend), which can be written in different languages and deployed/hosted anywhere.

Presentation Layer

(Business-) Logic Layer

Smart contracts in ETH

...again, from a software developer's point of view

- Comparable to a "*Class*" in OOP
- Can be written in different programming languages
  - Most popular one is "Solidity"
- Executed on the Ethereum Virtual Machine
  → Bytecode
- Need transactions to change their (internal) states
  - Transactions have to be mined (miner fee - "*Gas*")
- Once a contract is deployed, the contract is deployed!

What are we going to achieve?

- Create a smart contract
- Build an Angular UI
- Deploy and run the DApp

Let's start | Step 1

- Create a smart contract for ETH ←
- Build an Angular UI
- Run the DApp

Toolchain

- Various options for development

- Truffle
  A development environment, testing framework and asset pipeline for blockchains using the Ethereum Virtual Machine (EVM).

- Ganache
  A personal (one click) blockchain for Ethereum development you can use to deploy contracts, develop your applications, and run tests.

Live Coding

SMARTAUCTION

The smarter way to sell your goods.

Interface

- Functions
  - Bid
  - Withdraw (Favour pull over push payments)
  - End auction
  - Check if auction has already ended
- Events
  - Highest bid increased
  - Auction ended
- Public members
  - Beneficiary, auction end time, highest bidder, highest bid

Problem 1 | Reentrancy

```
function withdraw() public returns (bool) {
  uint amount = pendingReturns[msg.sender];

  if (amount > 0) {
    pendingReturns[msg.sender] = 0;

    if (!msg.sender.send(amount)) {
      pendingReturns[msg.sender] = amount;
      return false;
    }
  }

  return true;
}
```

```
function withdraw() public returns (bool) {
  uint amount = pendingReturns[msg.sender];

  if(amount > 0) {
    if(!highestBidder.send(amount)) {
      return false;
    }

    pendingReturns[msg.sender] = 0;
  }

  return true;
}
```

Problem 2 | Forced transaction error

```
function bid() public payable {
  require(now <= auctionEnd, "Auction already ended.");
  require(msg.value > highestBid, "There already is a higher bid.");

  if (highestBid != 0) {
    pendingReturns[highestBidder] += highestBid;
  }

  highestBidder = msg.sender;
  highestBid = msg.value;

  emit HighestBidIncreased(msg.sender, msg.value);
}
```

```
function bid() public payable {
  require(now <= auctionEnd, "Auction already ended.");
  require(msg.value > highestBid, "There already is a higher bid.");

  if (highestBid != 0) {
    highestBidder.transfer(highestBid);
  }

  highestBidder = msg.sender;
  highestBid = msg.value;

  emit HighestBidIncreased(msg.sender, msg.value);
}
```

Take a look!

https://github.com/ConsenSys/smart-contract-best-practices/blob/master/docs/known_attacks.md

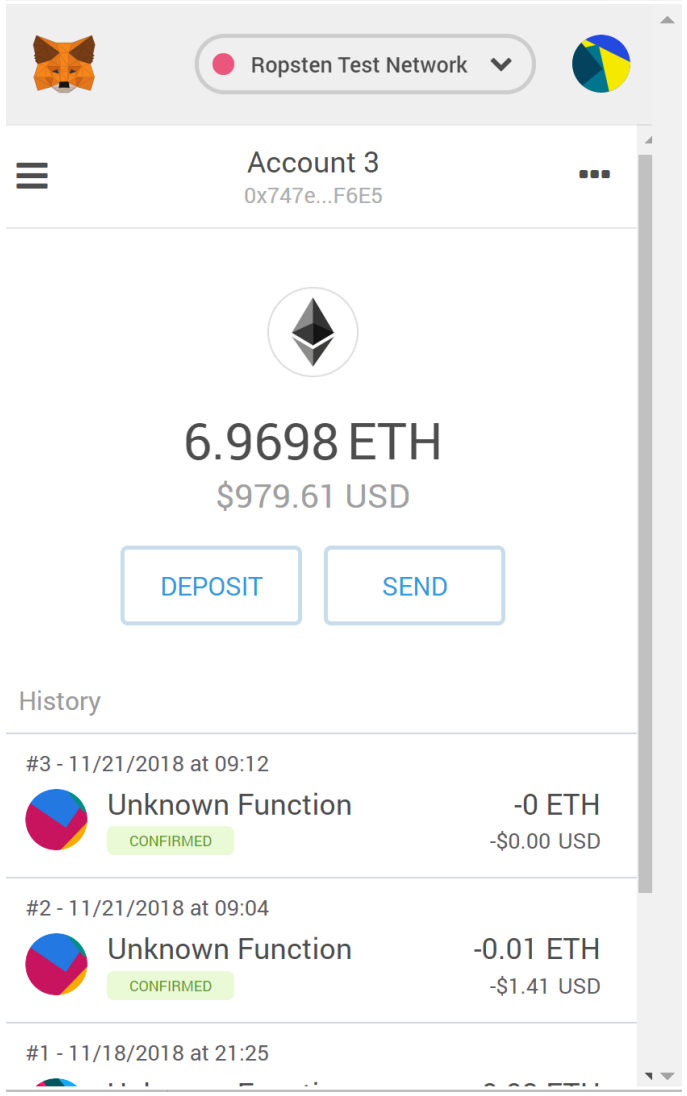
https://consensys.github.io/smart-contract-best-practices/recommendations/#favor-pull-over-push-for-external-calls

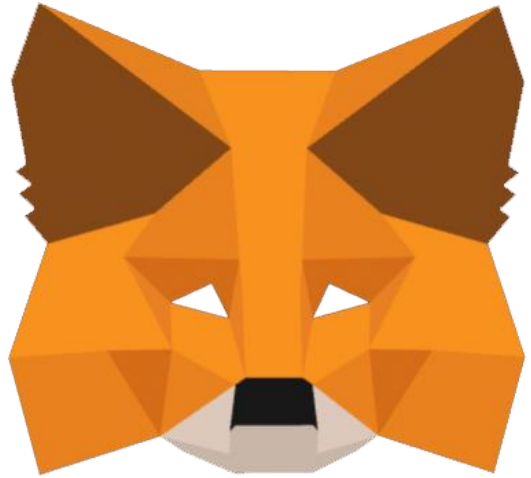
https://smartcontractsecurity.github.io/SWC-registry/

What's next? | Step 2

- Create a smart contract for ETH
- Build an Angular UI ←
- Run the DApp

MetaMask


Ropsten Test Network
Account 3
0x747e...F6E5
6.9698 ETH
$979.61 USD
DEPOSIT
SEND
History
#3 - 11/21/2018 at 09:12
Unknown Function
CONFIRMED
-0 ETH
-$0.00 USD
#2 - 11/21/2018 at 09:04
Unknown Function
CONFIRMED
-0.01 ETH
-$1.41 USD
#1 - 11/18/2018 at 21:25



Finish | Step 3

- Create a smart contract for ETH
- Build an Angular UI
- Run the DApp

Live deployment

https://ropsten.etherscan.io/address/0x45f3485480ffe178dc88c84c524c55439cff04e6

The sample code will be available here

https://github.com/PendelinP/SmartAuctionDemoBlockchainConf2018

...soon ;)

References

- https://www.ethereum.org/
- https://truffleframework.com/
- https://ropsten.etherscan.io
- https://dappradar.com/

Questions?

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