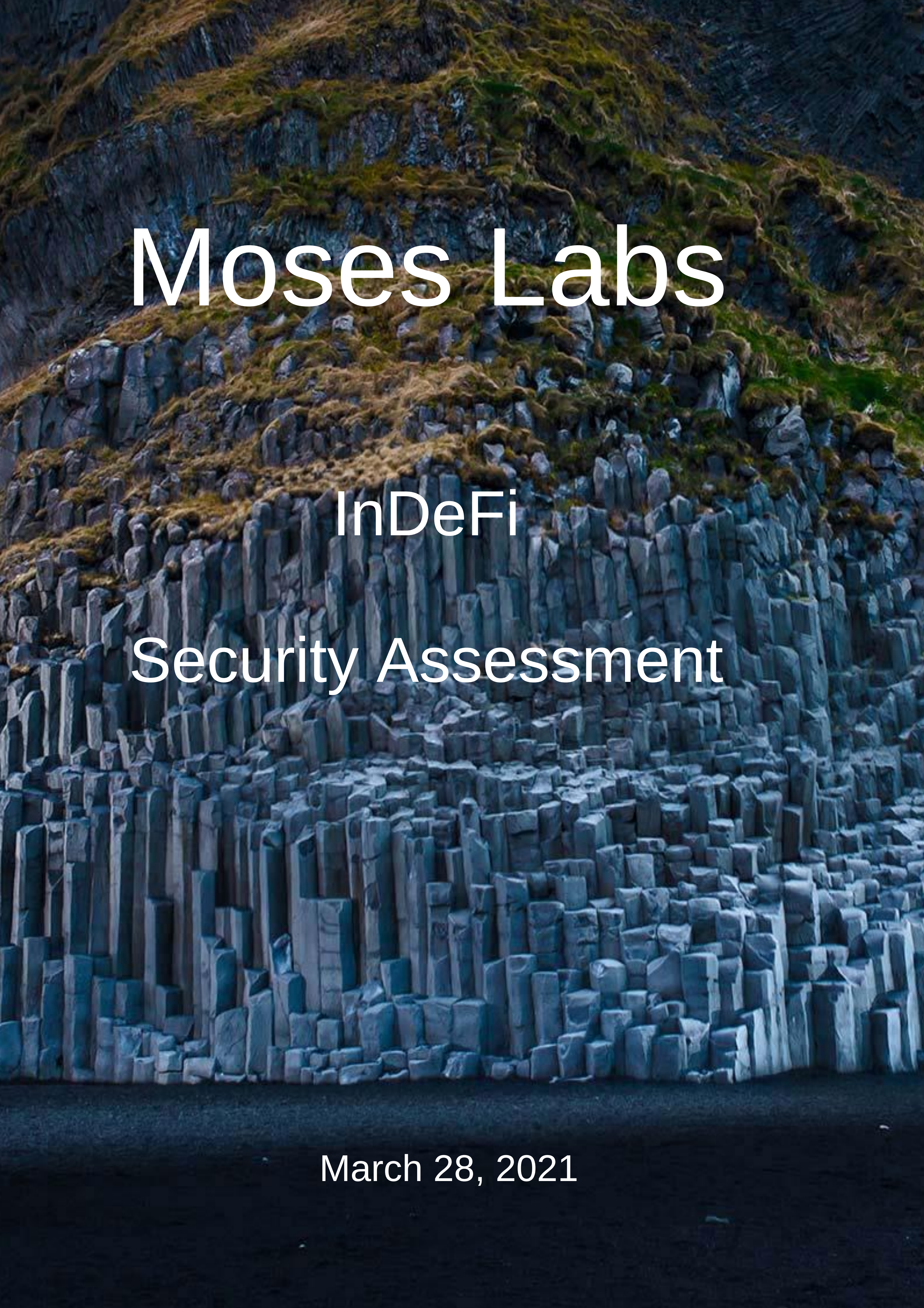


Moses Labs

InDeFi

Security Assessment

March 28, 2021

Contents

InDeFi Audit Summary

Project name : InDeFi Contract

Project address: https://indefi.finance

Code URL : https://github.com/indefi

Projct target : InDeFi Contract Audit

Test result : PASSED

Audit NO : 0728032021

Audit Team : Moses Labs

InDeFi Audit

The InDeFi team asked us to review and audit their InDeFi contract on hecochain and ethereum.
We looked at the code and now publish our results.

Here is our assessment and recommendations, in order of importance.

Document information

Name	Auditors	Version	Date
InDeFi Audit	Clay, Devos, Feiyun	1.0.0	2021-03-28

Audit results

Note that as of the date of publishing, the above review reflects the current understanding of known security patterns as they relate to the InDeFi contract. The above should not be construed as investment advice.

Based on the widely recognized security status of the current underlying blockchain and smart contract, this audit report is valid for 18 months from the date of output.

(Statement: Moses Labs reports only on facts that have occurred or existed before this report is issued and assumes corresponding responsibilities. Moses Labs is not able to determine the security of its smart contracts and is not responsible for any subsequent or existing facts after this report is issued. The security audit analysis and other content of this report are only based on the documents and information provided by the information provider to Moses Labs at the time of issuance of this report (" information provided " for short). Moses Labs postulates that the information provided is not missing, tampered, deleted, or hidden. If the information provided is missing, tampered, deleted, hidden, or reflected in a way that is not consistent with the actual situation, Moses Labs shall not be responsible for the losses and adverse effects caused.)

Audited target file

file	md5
LockReward.sol	496aee9cfd7b09e5f7593aa6ede34830
LpStakingRewards.sol	9afaa224bc193b2218c06cd2cfdf8ce5
MdxGoblin.sol	6e0bf572a105500e47e1f739a8276794
MdxStrategyAddTwoSidesOptimal.sol	a4b6f6cf5e95f61ce91dae7926bc489b
MdxStrategyLiquidate.sol	319cc1c01af55fdff1f1301f6eb91c71
MdxStrategyWithdrawMinimizeTrading.sol	63aaabc55eeb21da8683c04d20e7000f
Migrations.sol	50b3b1dc92806dc8f604fc8c5c65518f
IToken.sol	ed94032262fe9f0503edef7eba634bb3
ITokenFactory.sol	215a85acb6d48958d210b0a32c25d2bd
RewardsDistributionRecipient.sol	11d673f8337352ce2b619edae58d19d2
SafeToken.sol	dbf7b3de15d592fdcb69e126635552f6
Strategy.sol	39807428276ef75dbd6640ca0d94db77
Upgradable.sol	ea5f8579d2b32af48062b97cd9a8ac74
IBankConfig.sol	da6e79b4d96a9fc250017fd8b8aa7ffe
IHecoPool.sol	ff3699c8db3ec9329db37f323ee41e8d
IMdexFactory.sol	6997c5283c31c219d97208ee9ee2d636
IMdexPair.sol	8fca22f8a4524ea05c989d107812715a
IMdexRouter.sol	0b8d35d1472f91f45d17ea40c5804bbd
IStakingRewards.sol	c0e4532ea0e944d040ec54d309a80574
ISwapMining.sol	861b7565dade4196282f0c996bae87fc
IWHT.sol	e60f2cbabf40a21728a27073d1089b0c
InterestModel.sol	f2d54e2f23b97c85959e0070054c9547
IStakingRewards.sol	c0e4532ea0e944d040ec54d309a80574
ISwapMining.sol	861b7565dade4196282f0c996bae87fc
IWHT.sol	e60f2cbabf40a21728a27073d1089b0c
InterestModel.sol	f2d54e2f23b97c85959e0070054c9547

Vulnerability analysis

Vulnerability distribution

vulnerability level	number
Critical severity	0
High severity	0
Medium severity	0
Low severity	0

Summary of audit results

Vulnerability	status
Re-Entrancy	safe
Arithmetic Over/Under Flows	safe
Unexpected Ether	safe
Delegatecall	safe
Default Visibilities	safe
Entropy Illusion	safe
External Contract Referencing	safe
Short Address/Parameter Attack	safe
Unchecked CALL Return Values	safe
Race Conditions / Front Running	safe
Denial Of Service (DOS)	safe
Block Timestamp Manipulation	safe
Constructors with Care	safe
Unintialised Storage Pointers	safe
Floating Points and Numerical Precision	safe
tx.origin Authentication	safe

Analysis of audit results

Re-Entrancy

- **Description:**

  One of the features of smart contracts is the ability to call and utilise code of other external contracts. Contracts also typically handle ether, and as such often send ether to various external user addresses. The operation of calling external contracts, or sending ether to an address, requires the contract to submit an external call. These external calls can be hijacked by attackers whereby they force the contract to execute further code (i.e. through a fallback function) , including calls back into itself. Thus the code execution "re-enters" the contract. Attacks of this kind were used in the infamous DAO hack.
- **Detection results:**

```
PASSED!
```

Security suggestion:

no.

Arithmetic Over/Under Flows

Description:

The Virtual Machine (EVM) specifies fixed-size data types for integers. This means that an integer variable, only has a certain range of numbers it can represent. A uint8 for example, can only store numbers in the range [0,255]. Trying to store 256 into a uint8 will result in 0. If care is not taken, variables in Solidity can be exploited if user input is unchecked and calculations are performed which result in numbers that lie outside the range of the data type that stores them.

- **Detection results:**

```
PASSED!
```

- **Security suggestion:**

  no.

Unexpected Ether

- **Description:**

  Typically when ether is sent to a contract, it must execute either the fallback function, or another function described in the contract. There are two exceptions to this, where ether can exist in a contract without having executed any code. Contracts which rely on code execution for every ether sent to the contract can be vulnerable to attacks where ether is forcibly sent to a contract.
- **Detection results:**

```
PASSED!
```

- **Security suggestion:**
  no.

Delegatecall

- **Description:**
  The CALL and DELEGATECALL opcodes are useful in allowing developers to modularise their code. Standard external message calls to contracts are handled by the CALL opcode whereby code is run in the context of the external contract/function. The DELEGATECALL opcode is identical to the standard message call, except that the code executed at the targeted address is run in the context of the calling contract along with the fact that msg.sender and msg.value remain unchanged. This feature enables the implementation of libraries whereby developers can create reusable code for future contracts.
- **Detection results:**

```
PASSED!
```

Security suggestion: no.

Default Visibilities

Description:

Functions in Solidity have visibility specifiers which dictate how functions are allowed to be called. The visibility determines whether a function can be called externally by users, by other derived contracts, only internally or only externally. There are four visibility specifiers, which are described in detail in the Solidity Docs. Functions default to public allowing users to call them externally. Incorrect use of visibility specifiers can lead to some devestating vulernabilities in smart contracts as will be discussed in this section.

- **Detection results:**

```
PASSED!
```

Security suggestion:

no.

Entropy Illusion

- **Description:**
  All transactions on the blockchain are deterministic state transition operations. Meaning that every transaction modifies the global state of the ecosystem and it does so in a calculable way with no uncertainty. This ultimately means that inside the blockchain ecosystem there is no source of entropy or randomness. There is no rand() function in Solidity. Achieving decentralised entropy (randomness) is a well established problem and many ideas have been proposed to address this (see for example, RandDAO or using a chain of Hashes as described by Vitalik in this post).
- **Detection results:**

```
PASSED!
```

- **Security suggestion:**
  no.

External Contract Referencing

- **Description:**

  One of the benefits of the global computer is the ability to re-use code and interact with contracts already deployed on the network. As a result, a large number of contracts reference external contracts and in general operation use external message calls to interact with these contracts. These external message calls can mask malicious actors intentions in some non-obvious ways, which we will discuss.
- **Detection results:**

  ```
  PASSED!
  ```
- **Security suggestion:**

  no.

Unsolved TODO comments

- **Description:**

  Check for Unsolved TODO comments
- **Detection results:**

  ```
  PASSED!
  ```

Security suggestion:

no.

Short Address/Parameter Attack

Description:

This attack is not specifically performed on Solidity contracts themselves but on third party applications that may interact with them. I add this attack for completeness and to be aware of how parameters can be manipulated in contracts.

- **Detection results:**

  ```
  PASSED!
  ```
- **Security suggestion:**

  no.

Unchecked CALL Return Values

- **Description:**

  There a number of ways of performing external calls in solidity. Sending ether to external accounts is commonly performed via the transfer() method. However, the send() function can also be used and, for more versatile external calls, the CALL opcode can be directly employed in solidity. The call() and send() functions return a boolean indicating if the call succeeded or failed. Thus these functions have a simple caveat, in that the transaction that executes these functions will not revert if the external call (intialised by call() or send()) fails, rather the call() or send() will simply return false. A common pitfall arises when the return value is not checked, rather the developer expects a revert to occur.

- **Detection results:**

  ```
  PASSED!
  ```

- **Security suggestion:**

  no.

Race Conditions / Front Running

- **Description:**

  The combination of external calls to other contracts and the multi-user nature of the underlying blockchain gives rise to a variety of potential Solidity pitfalls whereby users race code execution to obtain unexpected states. Re-Entrancy is one example of such a race condition. In this section we will talk more generally about different kinds of race conditions that can occur on the blockchain. There is a variety of good posts on this subject, a few are: Wiki - Safety, DASP - Front-Running and the Consensus - Smart Contract Best Practices.

- **Detection results:**

  ```
  PASSED!
  ```

- **Security suggestion:**

  no.

Denial Of Service (DOS)

Description:

This category is very broad, but fundamentally consists of attacks where users can leave the contract inoperable for a small period of time, or in some cases, permanently. This can trap ether in these contracts forever, as was the case with the Second Parity MultiSig hack

- **Detection results:**

  ```
  PASSED!
  ```

Security suggestion:

no.

Block Timestamp Manipulation

- **Description:**

  Block timestamps have historically been used for a variety of applications, such as entropy for random numbers (see the Entropy Illusion section for further details), locking funds for periods of time and various state-changing conditional statements that are time-dependent. Miner's have the ability to adjust timestamps slightly which can prove to be quite dangerous if block timestamps are used incorrectly in smart contracts.

- **Detection results:**

  ```
  PASSED!
  ```

- **Security suggestion:**

  no.

Constructors with Care

- **Description:**
  Constructors are special functions which often perform critical, privileged tasks when initialising contracts. Before solidity v0.4.22 constructors were defined as functions that had the same name as the contract thatcontained them. Thus, when a contract name gets changed in development, if the constructor name isn't changed, it becomes a normal, callable function. As you can imagine, this can (and has) lead to some interesting contract hacks.
- **Detection results:**

  ```
  PASSED!
  ```

- **Security suggestion:**
  no.

Unintialised Storage Pointers

- **Description:**
  The EVM stores data either as storage or as memory. Understanding exactly how this is done and the default types for local variables of functions is highly recommended when developing contracts. This is because it is possible to produce vulnerable contracts by inappropriately intialising variables.
- **Detection results:**

  ```
  PASSED!
  ```

  Security suggestion: no.

Floating Points and Numerical Precision

- **Description:**
  As of this writing (Solidity v0.4.24), fixed point or floating point numbers are not supported. This means that floating point representations must be made with the integer types in Solidity. This can lead to errors/vulnerabilities if not implemented correctly.
- **Detection results:**

  ```
  PASSED!
  ```

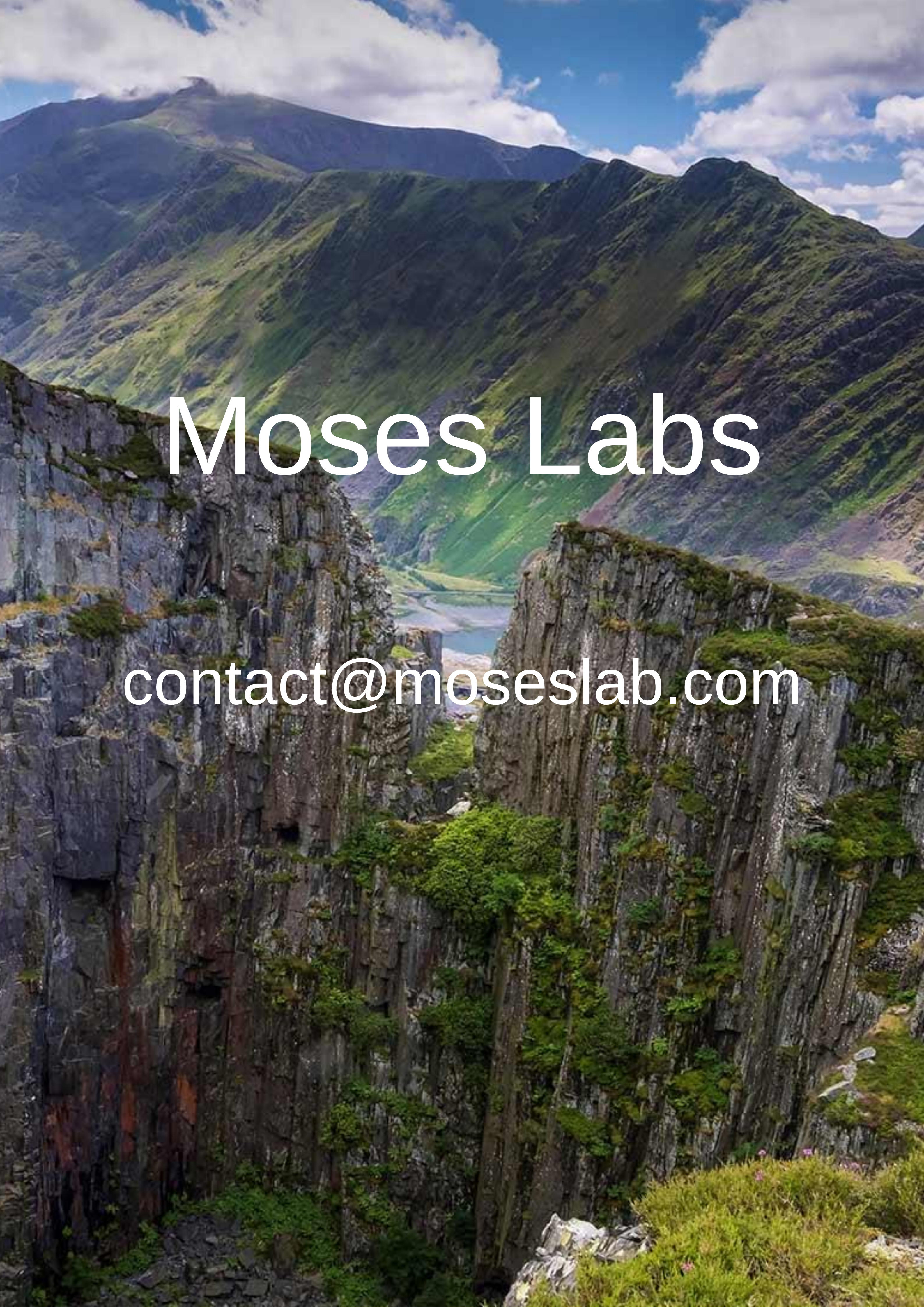
- **Security suggestion:**
  no.

tx.origin Authentication

- **Description:**
  Solidity has a global variable, tx.origin which traverses the entire call stack and returns the address of the account that originally sent the call (or transaction). Using this variable for authentication in smart contracts leaves the contract vulnerable to a phishing-like attack.
- **Detection results:**

  ```
  PASSED!
  ```

- **Security suggestion:**
  no.



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