DIA

Oracle v2

SMART CONTRACT AUDIT

17.05.2022

Made in Germany by Chainsulting.de

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1. Disclaimer

The audit makes no statements or warrantees about utility of the code, safety of the code, suitability of the business model, investment advice, endorsement of the platform or its products, regulatory regime for the business model, or any other statements about fitness of the contracts to purpose, or their bug free status. The audit documentation is for discussion purposes only.

The information presented in this report is confidential and privileged. If you are reading this report, you agree to keep it confidential, not to copy, disclose or disseminate without the agreement of D.I.A. e.V. . If you are not the intended receptor of this document, remember that any disclosure, copying or dissemination of it is forbidden.

Major Versions / Date	Description
0.1 (29.01.2022)	Layout
0.4 (30.01.2022)	Automated Security Testing Manual Security Testing
0.5 (31.01.2022)	Verify Claims and Test Deployment
0.6 (01.01.2022)	Testing SWC Checks
0.9 (01.01.2022)	Summary and Recommendation
1.0 (01.01.2022)	Final document
1.1 (01.01.2022)	Added final codebase
1.2 (15.05.2022)	Edit report

2. About the Project and Company

Company address:

D.I.A. e.V. (Association)
Baarerstrasse 10
6300 Zug
Switzerland

Website: https://diadata.org

Twitter: https://twitter.com/diadata_org

Medium: https://medium.com/@diadata_org

Telegram: https://t.me/DIAdata_org

LinkedIn: https://www.linkedin.com/company/diadata-org

GitHub: https://github.com/diadata-org/diadata

Reddit: https://www.reddit.com/user/DIAdata

YouTube: https://www.youtube.com/c/DIAdata_org

2.1 Project Overview

DIA (Decentralised Information Asset) is an open-source oracle platform that enables market actors to source, supply and share trustable data. DIA aims to be an ecosystem for open financial data in a financial smart contract ecosystem, to bring together data analysts, data providers and data users. In general, DIA provides a reliable and verifiable bridge between off-chain data from various sources and on-chain smart contracts that can be used to build a variety of financial DApps. DIA is the governance token of the platform. It is currently based on ERC-20 Ethereum protocol. The project was founded in 2018, while the token supply was made available to the public during the bonding curve sale from Aug. 3 through Aug. 17, 2020, where 10.2 million tokens were sold.

Who Are the Founders of DIA?
The DIA association was co-founded by a group of a dozen people, though Paul Claudius, Michael Weber and Samuel Brack are the leaders. Claudius is the face of the project and its lead advocate, sometimes also mentioned as a CBO. He has a masters degree in international management from ESCP Europe and a bachelors in business and economics from Passau University. Apart from working on DIA, he is also a co-founder and CEO of BlockState AG and c ventures. Before crypto, he had worked as director for a nutrition company called nu3. Weber is the project's CEO. He holds a asters in management from ESCP Business School and an equivalent to a bachelors in economics and physics from University of Cologne. He has worked in several banks and financial institutions before turning to crypto, where he founded such projects as Goodcoin, myLucy and BlockState. Samuel Brack serves DIA in the role of CTO. Like both Claudius and Weber, he shares the same position at BlockState. He has a masters degree in computer science from Humboldt University of Berlin, where as of January 2020, he is still studying for his PhD.

What Makes DIA Unique?
DIA aims to become the Wikipedia of financial data. It specifically addresses the problem of dated/unverified/hard to access data in the world of finance and crypto, especially DeFi, while proposing to solve it via system of financial incentives for users to keep the flow of open-source, validated data streams to the oracles up and running. The current design of oracles, DIA argues, is non-transparent, difficult to scale and vulnerable to attack. The DIA governance token will be used to fund data collection, data validation, voting on governance decisions and to incentivize the development of the platform. Users can stake DIA tokens to incentivise new data to appear on the platform, but access to historical data though DIA is free.

3. Vulnerability & Risk Level

Risk represents the probability that a certain source-threat will exploit vulnerability, and the impact of that event on the organization or system. Risk Level is computed based on CVSS version 3.0.

Level	Value	Vulnerability	Risk (Required Action)
Critical	9 – 10	A vulnerability that can disrupt the contract functioning in a number of scenarios, or creates a risk that the contract may be broken.	Immediate action to reduce risk level.
High	7 – 8.9	A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way.	Implementation of corrective actions as soon as possible.
Medium	4 – 6.9	A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.	Implementation of corrective actions in a certain period.
Low	2 – 3.9	A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.	Implementation of certain corrective actions or accepting the risk.
Informational	0 – 1.9	A vulnerability that have informational character but is not effecting any of the code.	An observation that does not determine a level of risk

4. Auditing Strategy and Techniques Applied

Throughout the review process, care was taken to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices. To do so, reviewed line-by-line by our team of expert pentesters and smart contract developers, documenting any issues as there were discovered.

4.1 Methodology

The auditing process follows a routine series of steps:

1. Code review that includes the following:
   i. Review of the specifications, sources, and instructions provided to Chainsulting to make sure we understand the size, scope, and functionality of the smart contract.
   ii. Manual review of code, which is the process of reading source code line-by-line in an attempt to identify potential vulnerabilities.
   iii. Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to Chainsulting describe.
2. Testing and automated analysis that includes the following:
   i. Test coverage analysis, which is the process of determining whether the test cases are actually covering the code and how much code is exercised when we run those test cases.
   ii. Symbolic execution, which is analysing a program to determine what inputs causes each part of a program to execute.
3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.
4. Specific, itemized, actionable recommendations to help you take steps to secure your smart contracts.

5. Metrics

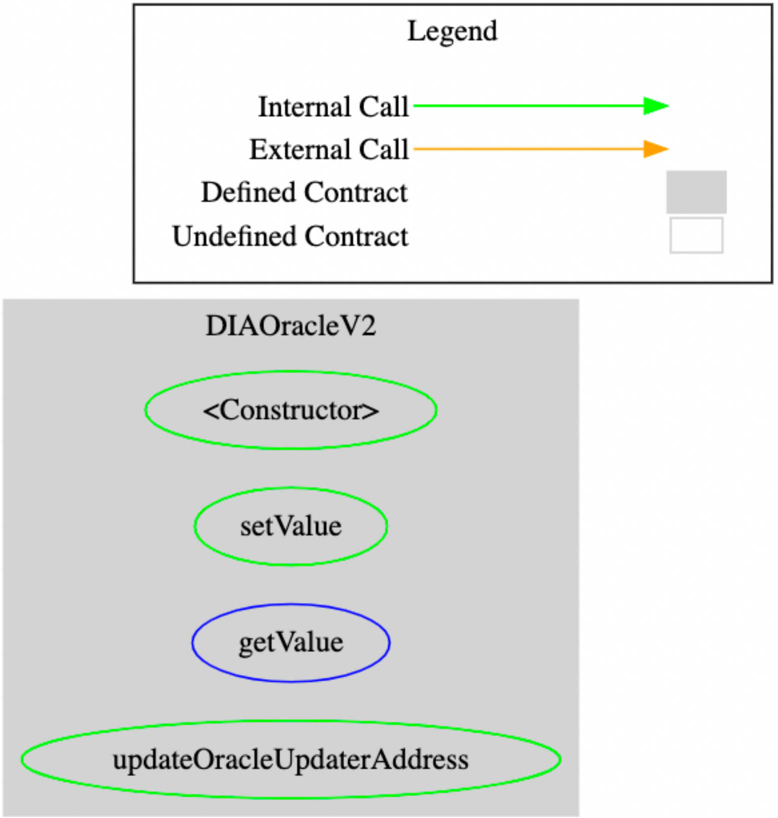
The metrics section should give the reader an overview on the size, quality, flows and capabilities of the codebase, without the knowledge to understand the actual code.

5.1 Tested Contract Files

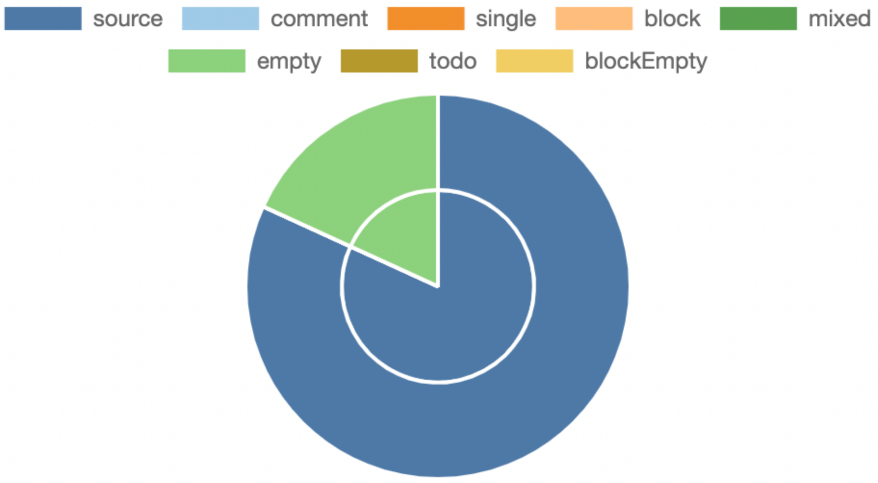
The following are the MD5 hashes of the reviewed files. A file with a different MD5 hash has been modified, intentionally or otherwise, after the security review. You are cautioned that a different MD5 hash could be (but is not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of the review

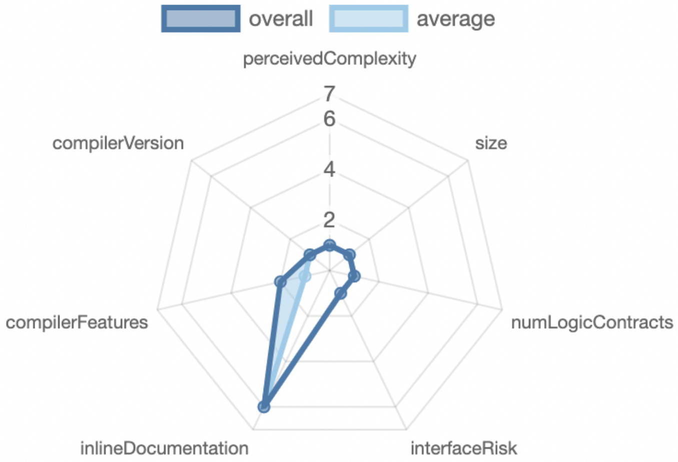
File	Fingerprint (MD5)
./DIAOracleV2.sol	9ea9ddbc37c32c5f125d8de61210a9d2

5.2 CallGraph



5.3 Source Lines & Risk





5.4 Capabilities

Solidity Versions observed	🧪 Experimental Features	💰 Can Receive Funds	🖥 Uses Assembly	💣 Has Destroyable Contracts
`0.7.4`				

📤 Transfers ETH	⚡ Low-Level Calls	👥 DelegateCall	🧮 Uses Hash Functions	🔖 ECRecover	🌀 New/Create/Create2

Exposed Functions

This section lists functions that are explicitly declared public or payable. Please note that getter methods for public stateVars are not included.

🌐Public	💰Payable
3	0

External	Internal	Private	Pure	View
1	3	0	0	1

StateVariables

Total	🌐Public
2	1

5.5 Source Unites in Scope

Type	File	Logic Contracts	Interfaces	Lines	nLines	nSLOC	Comment Lines	Complex. Score	Capabilities
📝	DIAOracleV2.sol	1		33	33	27		16	
📝	**Totals**	**1**		**33**	**33**	**27**	**0**	**16**	

Legend: [➖]

- **Lines**: total lines of the source unit
- **nLines**: normalized lines of the source unit (e.g. normalizes functions spanning multiple lines)
- **nSLOC**: normalized source lines of code (only source-code lines; no comments, no blank lines)
- **Comment Lines**: lines containing single or block comments
- **Complexity Score**: a custom complexity score derived from code statements that are known to introduce code complexity (branches, loops, calls, external interfaces, ...)

6. Scope of Work

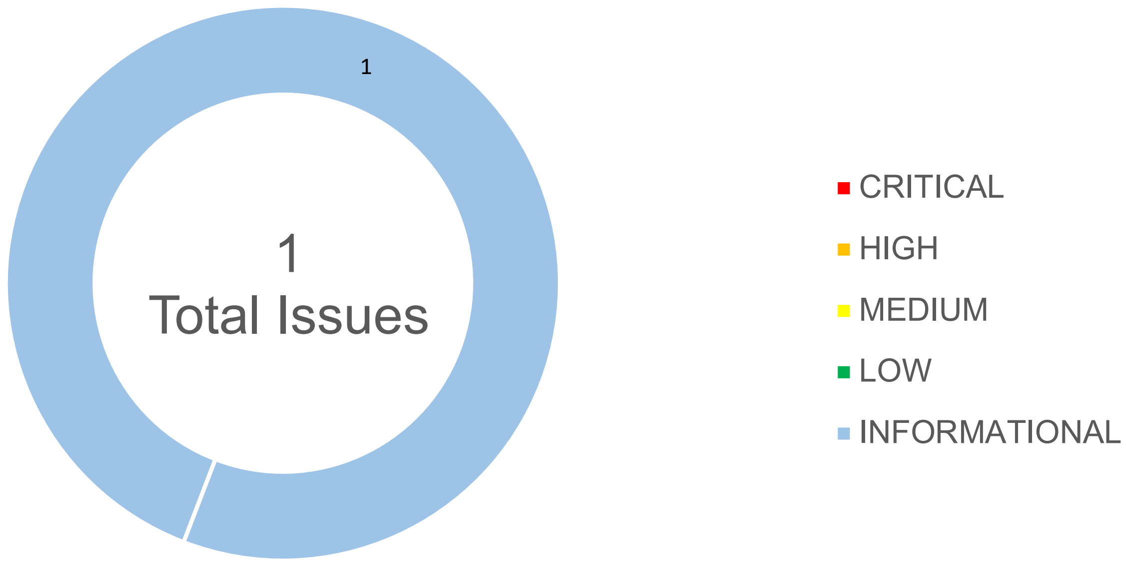
The DIA Data Team provided us with the file that needs to be tested. The scope of the audit is the Oracle v2 contract.

The team put forward the following assumptions regarding the security, usage of the contracts:

- Only the Oracle Updater can update key value
- Oracle Updater can be changed by the old oracle updater only
- The smart contract is coded according to the newest standards and in a secure way

The main goal of this audit was to verify these claims. The auditors can provide additional feedback on the code upon the client's request.

6.1 Findings Overview



No	Title	Severity	Status
6.2.1	Missing Natspec Documentation	INFORMATIONAL	ACKNOWLEDGED

6.2 Manual and Automated Vulnerability Test

CRITICAL ISSUES

During the audit, Chainsulting's experts found **no Critical issues** in the code of the smart contract.

HIGH ISSUES

During the audit, Chainsulting's experts found **no High issues** in the code of the smart contract.

MEDIUM ISSUES

During the audit, Chainsulting's experts found **no Medium issues** in the code of the smart contract

LOW ISSUES

During the audit, Chainsulting's experts found **no Low issues** in the code of the smart contract

INFORMATIONAL ISSUES

6.2.1 Missing Natspec Documentation

Severity: INFORMATIONAL
Status: ACKNOWLEDGED
Code: NA
File(s) affected: ALL

Attack / Description	Solidity contracts can use a special form of comments to provide rich documentation for functions, return variables and more. This special form is named the Ethereum Natural Language Specification Format (NatSpec).
Code	NA
Result/Recommendation	It is recommended to include natspec documentation and follow the doxygen style including @author, @title, @notice, @dev, @param, @return and make it easier to review and understand your smart contract.

6.3 SWC Attacks

ID	Title	Relationships	Test Result
SWC-131	Presence of unused variables	CWE-1164: Irrelevant Code	✅
SWC-130	Right-To-Left-Override control character (U+202E)	CWE-451: User Interface (UI) Misrepresentation of Critical Information	✅
SWC-129	Typographical Error	CWE-480: Use of Incorrect Operator	✅
SWC-128	DoS With Block Gas Limit	CWE-400: Uncontrolled Resource Consumption	✅
SWC-127	Arbitrary Jump with Function Type Variable	CWE-695: Use of Low-Level Functionality	✅
SWC-125	Incorrect Inheritance Order	CWE-696: Incorrect Behavior Order	✅
SWC-124	Write to Arbitrary Storage Location	CWE-123: Write-what-where Condition	✅
SWC-123	Requirement Violation	CWE-573: Improper Following of Specification by Caller	✅

ID	Title	Relationships	Test Result
SWC-122	Lack of Proper Signature Verification	CWE-345: Insufficient Verification of Data Authenticity	✅
SWC-121	Missing Protection against Signature Replay Attacks	CWE-347: Improper Verification of Cryptographic Signature	✅
SWC-120	Weak Sources of Randomness from Chain Attributes	CWE-330: Use of Insufficiently Random Values	✅
SWC-119	Shadowing State Variables	CWE-710: Improper Adherence to Coding Standards	✅
SWC-118	Incorrect Constructor Name	CWE-665: Improper Initialization	✅
SWC-117	Signature Malleability	CWE-347: Improper Verification of Cryptographic Signature	✅
SWC-116	Timestamp Dependence	CWE-829: Inclusion of Functionality from Untrusted Control Sphere	✅
SWC-115	Authorization through tx.origin	CWE-477: Use of Obsolete Function	✅
SWC-114	Transaction Order Dependence	CWE-362: Concurrent Execution using Shared Resource with Improper Synchronization ('Race Condition')	✅

ID	Title	Relationships	Test Result
SWC-113	DoS with Failed Call	CWE-703: Improper Check or Handling of Exceptional Conditions	✅
SWC-112	Delegatecall to Untrusted Callee	CWE-829: Inclusion of Functionality from Untrusted Control Sphere	✅
SWC-111	Use of Deprecated Solidity Functions	CWE-477: Use of Obsolete Function	✅
SWC-110	Assert Violation	CWE-670: Always-Incorrect Control Flow Implementation	✅
SWC-109	Uninitialized Storage Pointer	CWE-824: Access of Uninitialized Pointer	✅
SWC-108	State Variable Default Visibility	CWE-710: Improper Adherence to Coding Standards	✅
SWC-107	Reentrancy	CWE-841: Improper Enforcement of Behavioral Workflow	✅
SWC-106	Unprotected SELFDESTRUCT Instruction	CWE-284: Improper Access Control	✅
SWC-105	Unprotected Ether Withdrawal	CWE-284: Improper Access Control	✅
SWC-104	Unchecked Call Return Value	CWE-252: Unchecked Return Value	✅

ID	Title	Relationships	Test Result
SWC-103	Floating Pragma	CWE-664: Improper Control of a Resource Through its Lifetime	✅
SWC-102	Outdated Compiler Version	CWE-937: Using Components with Known Vulnerabilities	✅
SWC-101	Integer Overflow and Underflow	CWE-682: Incorrect Calculation	✅
SWC-100	Function Default Visibility	CWE-710: Improper Adherence to Coding Standards	✅

6.4 Verify claims

6.4.1 Only the oracle updater can update key value

Status: tested and verified ✅

```
    function setValue(string memory key, uint128 value, uint128 timestamp) public {
        require(msg.sender == oracleUpdater);
        uint256 cValue = (((uint256)(value)) << 128) + timestamp;
        values[key] = cValue;
        emit OracleUpdate(key, value, timestamp);
    }
```

6.4.2 Oracle Updater can be changed by the old oracle updater only

Status: tested and verified ✅

```
    function updateOracleUpdaterAddress(address newOracleUpdaterAddress) public {
        require(msg.sender == oracleUpdater);
        oracleUpdater = newOracleUpdaterAddress;
        emit UpdaterAddressChange(newOracleUpdaterAddress);
    }
```

6.4.3 The smart contract is coded according to the newest standards and in a secure way

Status: tested and verified ✅

7. Executive Summary

Our Chainsulting expert performed an audit of the smart contract codebase. The final debriefs took place on the January 30, 2022.

The main goal of the audit was to verify the claims regarding the security of the smart contract and the claims inside the scope of work. During the audit, no critical issues were found after the manual and automated security testing.

8. Deployed Smart Contract

```
// compiled using solidity 0.7.4

pragma solidity 0.7.4;

contract DIAOracleV2 {
    mapping (string => uint256) public values;
    address oracleUpdater;

    event OracleUpdate(string key, uint128 value, uint128 timestamp);
    event UpdaterAddressChange(address newUpdater);

    constructor() {
        oracleUpdater = msg.sender;
    }

    function setValue(string memory key, uint128 value, uint128 timestamp) public {
        require(msg.sender == oracleUpdater);
        uint256 cValue = (((uint256)(value)) << 128) + timestamp;
        values[key] = cValue;
```

```
        emit OracleUpdate(key, value, timestamp);
    }

    function getValue(string memory key) external view returns (uint128, uint128) {
        uint256 cValue = values[key];
        uint128 timestamp = (uint128)(cValue % 2**128);
        uint128 value = (uint128)(cValue >> 128);
        return (value, timestamp);
    }

    function updateOracleUpdaterAddress(address newOracleUpdaterAddress) public {
        require(msg.sender == oracleUpdater);
        oracleUpdater = newOracleUpdaterAddress;
        emit UpdaterAddressChange(newOracleUpdaterAddress);
    }
}
```

9. About the Auditor

Chainsulting is a professional software development firm, founded in 20217 and based in Germany. They show ways, opportunities, risks and offer comprehensive blockchain solutions. Some of their services include blockchain development, smart contract audits and consulting.

Chainsulting conducts code audits on market-leading blockchains such as Hyperledger, Tezos, Ethereum, Binance Smart Chain, and Solana to mitigate risk and instil trust and transparency into the vibrant crypto community. They have also reviewed and secure the smart contracts of 1Inch, POA Network, Unicrypt, Amun, Furucombo among numerous other top DeFi projects.

Chainsulting currently secures $100 billion in user funds locked in multiple DeFi protocols. The team behind the leading audit firm relies on their robust technical know-how in the blockchain sector to deliver top-notch smart contract audit solutions, tailored to the clients' evolving business needs.

Check our website for further information: https://chainsulting.de