METATRUST

Security Assessment for

DLC-link-solidity

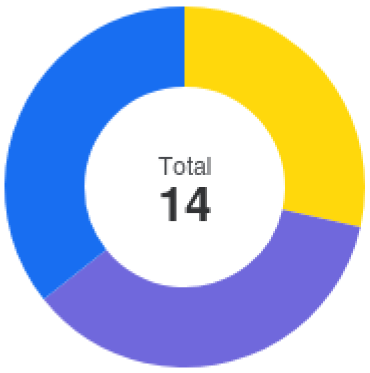
May 07, 2024

Executive Summary

Overview	
Project Name	DLC-link-solidity
Codebase URL	https://github.com/DLC-link/dlc-solidity
Scan Engine	Security Analyzer
Scan Time	2024/05/07 08:00:00
Commit Id	b042c767bbfa3de024222ed762a37cdbfa2ecd49 92420f4b42554fce506179087b91fdf72ae44ccb

Total	
Critical Issues	0
High risk Issues	0
Medium risk Issues	4
Low risk Issues	5
Informational Issues	5

Critical Issues	The issue can cause large economic losses, large-scale data disorder, loss of control of authority management, failure of key functions, or indirectly affect the correct operation of other smart contracts interacting with it.
High Risk Issues	The issue puts a large number of users' sensitive information at risk or is reasonably likely to lead to catastrophic impacts on clients' reputations or serious financial implications for clients and users.
Medium Risk Issues	The issue puts a subset of users' sensitive information at risk, would be detrimental to the client's reputation if exploited, or is reasonably likely to lead to moderate financial impact.
Low Risk Issues	The risk is relatively small and could not be exploited on a recurring basis, or is a risk that the client has indicated is low-impact in view of the client's business circumstances.
Informational Issue	The issue does not pose an immediate risk but is relevant to security best practices or Defence in Depth.



Critical Issues	0%	0
High risk Issues	0%	0
Medium risk Issues	29%	4
Low risk Issues	36%	5
Informational Issues	36%	5

Summary of Findings

MetaScan security assessment was performed on **May 07, 2024 08:00:00** on project **DLC-link-solidity** with the repository on branch **default branch**. The assessment was carried out by scanning the project's codebase using the scan engine **Security Analyzer**. There are in total **14** vulnerabilities / security risks discovered during the scanning session, among which **4** medium risk vulnerabilities, **5** low risk vulnerabilities, **5** informational issues.

ID	Description	Severity	Alleviation
MSA-001	When the whitelisted contracts are the approved signers	Medium risk	Fixed
MSA-002	Probably mis-calculate the `_signerCount`	Medium risk	Fixed
MSA-003	The mint fee does not be sent to the fee recipient	Medium risk	Fixed
MSA-004	Centralized Roles	Medium risk	Acknowledged
MSA-005	Potential being out of gas as the increasement of `dlcs`	Low risk	Fixed
MSA-006	Upgradeable contracts missing a storage gap variable `__gap[50]`	Low risk	Fixed
MSA-007	The init threshold value from design document mismatches its implementation	Low risk	Acknowledged
MSA-008	The improper values of the `_threshold` and the `_minimumThreshold` may block the `_attestorMultisigIsValid` function	Low risk	Fixed
MSA-009	Upgradeable contracts missing a storage gap variable `__gap[50]`	Low risk	Fixed
MSA-010	Lack of validating the `_threshold`	Informational	Fixed
MSA-011	Gas optimazation	Informational	Fixed
MSA-012	Combining the chain id and contract address when calculating the UUID	Informational	Acknowledged
MSA-013	Lack of the fee rate boundary	Informational	Fixed
MSA-014	Missing emit event	Informational	Fixed

Findings

Medium risk (4)

1. When the whitelisted contracts are the approved signers

Medium risk   Security Analyzer

The whitelisted contracts are able to create a DLC with the `createDLC` function, and mark a DLC's status as `READY`, with the `createDLC` function.

The approved signers are able to update a DLC's status from `READY` to `FUNDED`, with the `setStatusFunded` function.

The DLC's creator, i.e. the whitelisted contract, is able to update a DLC's status from `FUNDED` to `CLOSING`, with the `closeDLC` function.

The approved signers are able to update a DLC's status from `CLOSING` to `CLOSED`, with the `postCloseDLC` function.

In a nutshell, the whitelisted contracts are able to update a DLC's status from none, and `FUNDED` to `READY`, and `CLOSING`. The approved signers are able to update a DLC's status from `READY`, and `CLOSING` to `FUNDED`, and `CLOSED`

If the whitelisted contracts are the approved signers, a DLC can go through states `READY`, `FUNDED`, `CLOSING`, and `CLOSED` without any restriction, which is a centralization risk.

File(s) Affected

contracts/DLCManager.sol #198-208

```
    function createDLC(
        uint256 valueLocked,
        string calldata btcFeeRecipient,
        uint256 btcMintFeeBasisPoints,
        uint256 btcRedeemFeeBasisPoints
    )
        external
        override
        onlyWhiteListedContracts
        whenNotPaused
        returns (bytes32)
```

contracts/DLCManager.sol #247-264

```
    function setStatusFunded(
        bytes32 uuid,
        string calldata btcTxId,
        bytes[] calldata signatures
    ) external whenNotPaused onlyApprovedSigners {
        _attestorMultisigIsValid(abi.encode(uuid, btcTxId), signatures);
        DLCLink.DLC storage dlc = dlcs[dlcIDsByUUID[uuid]];

        if (dlc.uuid == bytes32(0)) revert DLCNotFound();
        if (dlc.status != DLCLink.DLCStatus.READY) revert DLCNotReady();

        dlc.fundingTxId = btcTxId;
        dlc.status = DLCLink.DLCStatus.FUNDED;

        DLCLinkCompatible(dlc.protocolContract).setStatusFunded(uuid, btcTxId);

        emit SetStatusFunded(uuid, btcTxId, msg.sender);
    }
```

contracts/DLCManager.sol #247-251

```
    function setStatusFunded(
        bytes32 uuid,
        string calldata btcTxId,
        bytes[] calldata signatures
    ) external whenNotPaused onlyApprovedSigners {
```

contracts/DLCManager.sol #270-272

```
    function closeDLC(
        bytes32 uuid
    ) external onlyCreatorContract(uuid) whenNotPaused {
```

contracts/DLCManager.sol #290-294

```
    function postCloseDLC(
        bytes32 uuid,
        string calldata btcTxId,
        bytes[] calldata signatures
    ) external whenNotPaused onlyApprovedSigners {
```

Recommendation

Consider adding checks to ensure that approved signers and whitelisted contracts are not at the same address.

Alleviation Fixed

The team fixed this issue by adding an extra role based check in commit 08ad24555bea64d5a678f1a68c88165af4922217

2. Probably mis-calculate the `_signerCount`

Medium risk Security Analyzer

The `addApprovedSigner` function adds an account as a signer and increases the counter `_signerCount`. Meanwhile, the `removeApprovedSigner` validates the `_signerCount` and ensures it not to be less than the `_minimumThreshold`.

Taking this scenario into account,

- The admin adds Alice as a signer, and assumes the `_minimumThreshold` is 2;

- The admin repeatedly adds Bob with the **addApprovedSigner** function 5 times, due to the function lack of checking if the **signer** is approved or not, which results in the **_signerCount** to be 6;
- The admin removes Alice and Bob from the approved signers, which results in the number of valid signers being 0. Because the **_signerCount** is 4, which is greater than the **_minimumThreshold** that is 2.

As a result, the validation of the **removeApprovedSigner** fails to keep a minimum threshold of signers.

File(s) Affected

contracts/DLCManager.sol #366-377

```solidity
    function addApprovedSigner(address signer) external onlyAdmin {
        _approvedSigners[signer] = true;
        _signerCount++;
    }

    function removeApprovedSigner(address signer) external onlyAdmin {
        if (_signerCount == _minimumThreshold)
            revert ThresholdMinimumReached(_minimumThreshold);
        if (!_approvedSigners[signer]) revert SignerNotApproved(signer);
        _approvedSigners[signer] = false;
        _signerCount--;
    }
```

Recommendation

Consider checking if a signer is approved before from the **addApprovedSigner** function.

Alleviation Fixed

The team resolved this issue by replacing the `addApprovedSigner` function with the function `grantRole` that check the role existence, in commits 4e6e428e714ab4d44d29d1c32d6eb9446352b1a9 and 08ad24555bea64d5a678f1a68c88165af4922217

3. The mint fee does not be sent to the fee recipient

Medium risk Security Analyzer

The **mintFeeRate** is initialized as 0, thus, there is no mint fee so far.

The admin can update the **mintFeeRate** and **_btcFeeRecipient** with the **setMintFeeRate** function and the **setBtcFeeRecipient** function, if the **mintFeeRate** is greater than 0, the protocol will charge a mint fee, however, the fee does not be sent to the fee recipient.

File(s) Affected

contracts/TokenManager.sol #225-233

```solidity
    function setStatusFunded(
        bytes32 uuid,
        string calldata btcTxId
    ) external override whenNotPaused onlyDLCManagerContract {
        DLCLink.DLC memory dlc = dlcManager.getDLC(uuid);

        _mintTokens(dlc.creator, _getFeeAdjustedAmount(dlc.valueLocked));
        emit SetStatusFunded(uuid, btcTxId, dlc.creator);
    }
```

contracts/TokenManager.sol #121-121

```solidity
        mintFeeRate = 0; // 0% dlcBTC fee for now
```

contracts/TokenManager.sol #327-330

```
    function setMintFeeRate(uint256 newMintFeeRate) external onlyDLCAdmin {
        mintFeeRate = newMintFeeRate;
        emit SetMintFeeRate(newMintFeeRate);
    }
```

contracts/TokenManager.sol #346-351

```
    function setBtcFeeRecipient(
        string calldata btcFeeRecipient
    ) external onlyDLCAdmin {
        _btcFeeRecipient = btcFeeRecipient;
        emit SetBtcFeeRecipient(btcFeeRecipient);
    }
```

Recommendation

Recommend sending the mint fee to the fee recipient.

Alleviation Fixed

The team fixed this issue by sending fees to the fee recipient in the commit 45ed634b84e537b6201d27af721df22ca0d71c77.

4. Centralized Roles

Medium risk Security Analyzer

In the `DLCBTC` contract, the owner has the privilege of the following functions:

- `mint`: This function allows the owner to mint new DLCBTC tokens and assign them to a specified address.
- `burn`: This function allows the owner to burn existing DLCBTC tokens from a specified address.

In the `DLCManager` contract, the admin has the privilege of the following functions:

- `pauseContract`: Pauses the contract, preventing further execution of certain functions;
- `unpauseContract`: Unpauses the contract, allowing execution of previously paused functions;
- `getThreshold`: Retrieves the current threshold value for signature validation;
- `setThreshold`: Sets a new threshold value for signature validation;
- `addApprovedSigner`: Adds an approved signer for attestation;
- `removeApprovedSigner`: Removes an approved signer for attestation.

In the `DLCManager` contract, the approved signers has the privilege of the following functions:

- `setStatusFunded`: Confirms that a DLC was 'funded' on the Bitcoin blockchain.
- `postCloseDLC`: Triggered after a closing Tx has been confirmed Bitcoin.

In the `DLCManager` contract, the whitelisted contracts have the privilege of the following functions:

- `createDLC`: Triggers the creation of an Announcement in the Attestor Layer.

In the `TokenManager` contract, the DLC admin has the privilege of the following functions:

- `whitelistAddress`: Whitelist an address for creating new vaults;
- `unwhitelistAddress`: Unwhitelist an address from creating new vaults;
- `setMinimumDeposit`: Set the minimum deposit amount for creating vaults;
- `setMaximumDeposit`: Set the maximum deposit amount for creating vaults;
- `setMintFeeRate`: Set the mint fee rate for minting dlcBTC tokens;
- `setBtcMintFeeRate`: Set the BTC mint fee rate for creating vaults;
- `setBtcRedeemFeeRate`: Set the BTC redeem fee rate for closing vaults;
- `setBtcFeeRecipient`: Set the BTC fee recipient address for fee collection;
- `setWhitelistingEnabled`: Enable or disable whitelisting of addresses for vault creation;
- `updateDLCManagerContract`: Update the DLCManager contract address;
- `transferTokenContractOwnership`: Transfer ownership of the token contract;

- `pauseContract`: Pause the contract to prevent further actions;
- `unpauseContract`: Unpause the contract to allow actions to resume.

File(s) Affected

contracts/DLCBTC.sol #29-35

```
    function mint(address to, uint256 amount) external onlyOwner {
        _mint(to, amount);
    }

    function burn(address from, uint256 amount) external onlyOwner {
        _burn(from, amount);
    }
```

contracts/DLCManager.sol #344-374

```
    //                        ADMIN FUNCTIONS                           //
    //////////////////////////////////////////////////////////////////

    function pauseContract() external onlyAdmin {
        _pause();
    }

    function unpauseContract() external onlyAdmin {
        _unpause();
    }

    function getThreshold() external view onlyAdmin returns (uint16) {
        return _threshold;
    }

    function setThreshold(uint16 newThreshold) external onlyAdmin {
        if (newThreshold < _minimumThreshold)
            revert ThresholdTooLow(_minimumThreshold);
        _threshold = newThreshold;
        emit SetThreshold(newThreshold);
    }

    function addApprovedSigner(address signer) external onlyAdmin {
        _approvedSigners[signer] = true;
        _signerCount++;
    }

    function removeApprovedSigner(address signer) external onlyAdmin {
        if (_signerCount == _minimumThreshold)
            revert ThresholdMinimumReached(_minimumThreshold);
        if (!_approvedSigners[signer]) revert SignerNotApproved(signer);
```

contracts/DLCManager.sol #244-261

```
     * @param   btcTxId  DLC Funding Transaction ID on the Bitcoin blockchain.
     * @param   signatures  Signatures of the Attestors.
     */
    function setStatusFunded(
        bytes32 uuid,
        string calldata btcTxId,
        bytes[] calldata signatures
    ) external whenNotPaused onlyApprovedSigners {
        _attestorMultisigIsValid(abi.encode(uuid, btcTxId), signatures);
        DLCLink.DLC storage dlc = dlcs[dlcIDsByUUID[uuid]];

        if (dlc.uuid == bytes32(0)) revert DLCNotFound();
        if (dlc.status != DLCLink.DLCStatus.READY) revert DLCNotReady();

        dlc.fundingTxId = btcTxId;
        dlc.status = DLCLink.DLCStatus.FUNDED;

        DLCLinkCompatible(dlc.protocolContract).setStatusFunded(uuid, btcTxId);
```

contracts/DLCManager.sol #195-235

```
     * @param   btcRedeemFeeBasisPoints  Basis points of the redeeming fee.
     * @return  bytes32  A generated UUID.
     */
    function createDLC(
        uint256 valueLocked,
        string calldata btcFeeRecipient,
        uint256 btcMintFeeBasisPoints,
        uint256 btcRedeemFeeBasisPoints
    )
        external
        override
        onlyWhiteListedContracts
        whenNotPaused
        returns (bytes32)
    {
        bytes32 _uuid = _generateUUID(tx.origin, _index);

        dlcs[_index] = DLCLink.DLC({
            uuid: _uuid,
            protocolContract: msg.sender,
            valueLocked: valueLocked,
            timestamp: block.timestamp,
            creator: tx.origin,
            status: DLCLink.DLCStatus.READY,
            fundingTxId: "",
            closingTxId: "",
            btcFeeRecipient: btcFeeRecipient,
            btcMintFeeBasisPoints: btcMintFeeBasisPoints,
            btcRedeemFeeBasisPoints: btcRedeemFeeBasisPoints
        });

        emit CreateDLC(
            _uuid,
            valueLocked,
            msg.sender,
            tx.origin,
            block.timestamp
        );

        dlcIDsByUUID[_uuid] = _index;
        _index++;
```

contracts/DLCManager.sol #287-307

```
     * @param   btcTxId  Closing Bitcoin Tx id.
     * @param   signatures  Signatures of the Attestors.
     */
    function postCloseDLC(
        bytes32 uuid,
        string calldata btcTxId,
        bytes[] calldata signatures
    ) external whenNotPaused onlyApprovedSigners {
        _attestorMultisigIsValid(abi.encode(uuid, btcTxId), signatures);
        DLCLink.DLC storage dlc = dlcs[dlcIDsByUUID[uuid]];

        if (dlc.uuid == bytes32(0)) revert DLCNotFound();
        if (dlc.status != DLCLink.DLCStatus.CLOSING) revert DLCNotClosing();

        dlc.closingTxId = btcTxId;
        dlc.status = DLCLink.DLCStatus.CLOSED;

        DLCLinkCompatible(dlc.protocolContract).postCloseDLCHandler(
            uuid,
            btcTxId
        );
```

contracts/TokenManager.sol #299-381

```
    function whitelistAddress(
        address addressToWhitelist
    ) external onlyDLCAdmin {
        _whitelistedAddresses[addressToWhitelist] = true;
        emit WhitelistAddress(addressToWhitelist);
    }

    function unwhitelistAddress(
        address addressToUnWhitelist
    ) external onlyDLCAdmin {
        _whitelistedAddresses[addressToUnWhitelist] = false;
        emit UnwhitelistAddress(addressToUnWhitelist);
    }

    function setMinimumDeposit(
        uint256 newMinimumDeposit
    ) external onlyDLCAdmin {
        minimumDeposit = newMinimumDeposit;
        emit SetMinimumDeposit(newMinimumDeposit);
    }

    function setMaximumDeposit(
        uint256 newMaximumDeposit
    ) external onlyDLCAdmin {
        maximumDeposit = newMaximumDeposit;
        emit SetMaximumDeposit(newMaximumDeposit);
    }

    function setMintFeeRate(uint256 newMintFeeRate) external onlyDLCAdmin {
        mintFeeRate = newMintFeeRate;
        emit SetMintFeeRate(newMintFeeRate);
    }

    function setBtcMintFeeRate(
        uint256 newBtcMintFeeRate
    ) external onlyDLCAdmin {
        btcMintFeeRate = newBtcMintFeeRate;
        emit SetBtcMintFeeRate(newBtcMintFeeRate);
    }

    function setBtcRedeemFeeRate(
        uint256 newBtcRedeemFeeRate
    ) external onlyDLCAdmin {
        btcRedeemFeeRate = newBtcRedeemFeeRate;
        emit SetBtcRedeemFeeRate(newBtcRedeemFeeRate);
    }

    function setBtcFeeRecipient(
        string calldata btcFeeRecipient
    ) external onlyDLCAdmin {
        _btcFeeRecipient = btcFeeRecipient;
        emit SetBtcFeeRecipient(btcFeeRecipient);
    }

    function setWhitelistingEnabled(
        bool isWhitelistingEnabled
    ) external onlyDLCAdmin {
            whitelistingEnabled = isWhitelistingEnabled;
            emit SetWhitelistingEnabled(isWhitelistingEnabled);
        }

        function updateDLCManagerContract(
            address newDLCManagerAddress
        ) external onlyDLCAdmin {
            dlcManager = IDLCManager(newDLCManagerAddress);
            _grantRole(DLC_MANAGER_ROLE, newDLCManagerAddress);
            emit NewDLCManagerContract(newDLCManagerAddress);
        }

        function transferTokenContractOwnership(
            address newOwner
        ) external onlyDLCAdmin {
            dlcBTC.transferOwnership(newOwner);
            emit TransferTokenContractOwnership(newOwner);
        }

        function pauseContract() external onlyPauser {
            _pause();
        }

        function unpauseContract() external onlyPauser {
            _unpause();
        }
```

Recommendation

Consider implementing a decentralized governance mechanism or a multi-signature scheme that requires consensus among multiple parties before pausing or unpausing the contract. This can help mitigate the centralization risk associated with a single owner controlling critical contract functions. Alternatively, you can provide a clear justification for the centralization aspect and ensure that users are aware of the potential risks associated with a single point of control.

Alleviation Acknowledged

The team responded that the DLCAdmin role will be a Gnosis SAFE Multisig account. The team would post the members/threshold of this multisig on their public channels for providing trust. Eventually, it could be delegated to a DAO or a multisig contract.

Low risk (5)

1. Potential being out of gas as the increasement of `dlcs`   Low risk   Security Analyzer

The function `getFundedTxIds` gets DLCs whose status is `FUNDED` by iterating the whole `dlcs` mapping.

The number of funded DLC would not be a big number, however, the `dlcs` mapping increases day by day, and will be a big size one. As a result, the interating of the whole `dlcs` will cost much gas in the future, moreover, probably result in a out of gas error.

File(s) Affected

contracts/DLCManager.sol #331-341

```
    function getFundedTxIds() public view returns (string[] memory) {
        string[] memory _fundedTxIds = new string[](_index);
        uint256 _fundedTxIdsCount = 0;
        for (uint256 i = 0; i < _index; i++) {
            if (dlcs[i].status == DLCLink.DLCStatus.FUNDED) {
                _fundedTxIds[_fundedTxIdsCount] = dlcs[i].fundingTxId;
                _fundedTxIdsCount++;
            }
        }
        return _fundedTxIds;
    }
```

Recommendation

Consider getting transactions from the `dlcs` by a specified range, like `startIndex`, and `endIndex`.

Alleviation Fixed

The team fixed this issue by limiting the range for read, in the commit a5ee45262973ac0d80e0894c59787a8d076b0ad5.

2. Upgradeable contracts missing a storage gap variable `__gap[50]`

Low risk Security Analyzer

Contracts `TokenManager`, and `DLCManager` are upgradeable contracts, which missing the corresponding storage gap variable `__gap[50]` for the future upgradeable.

Storage Gaps | Openzepplin: *Storage gaps are empty reserved space in storage that is put in place in Upgradeable contracts. It allows us to freely add new state variables in the future without compromising the storage compatibility with existing deployments.*

File(s) Affected

contracts/DLCManager.sol #28-32

```
contract DLCManager is
    Initializable,
    AccessControlDefaultAdminRulesUpgradeable,
    PausableUpgradeable,
    IDLCManager
```

contracts/TokenManager.sol #34-38

```
contract TokenManager is
    Initializable,
    AccessControlDefaultAdminRulesUpgradeable,
    PausableUpgradeable,
    DLCLinkCompatible
```

Recommendation

Consider adding storage gaps for upgradeable contracts.

Alleviation Fixed

The team fixed this issue by adding a gap variable, in the commit 7a42606b39c0f25639f241bb7b87f2b961690947.

3. The init threshold value from design document mismatches its implementation

Low risk Security Analyzer

The document DLC.Link Technical Architecture v1.2 mentioned that to mitigate this risk, we are designing for a minimum of 7 total node operators, and a minimum threshold of 4.

But, in the `initialize` function, the `_minimumThreshold` is initialized as 2.

File(s) Affected

contracts/DLCManager.sol #110-110

```
110         _minimumThreshold = 2;
```

Recommendation

Consider checking the design and the implementation, and align them.

Alleviation Acknowledged

The team acknowledged this finding.

4. The improper values of the `_threshold` and the `_minimumThreshold` may block the `_attestorMultisigIsValid` function

Low risk Security Analyzer

The improper values of the `_threshold` and the `_minimumThreshold` may block the `_attestorMultisigIsValid` function

Taking the below scenario into account:

- The `_minimumThreshold` is initialized as 2;
- The admin sets the `_threshold` as 4 with the `setThreshold` function, the function executes sucessfully because the condition `4 < 2` is false;
- The admin adds three approved signers, Alice, Bob, and Carol, and removes Carol, which still matches the requirement of the check on the `_minimumThreshold` from the `removeApprovedSigner`;
- Alice or Bob set the DLC as funded with their 2 signatures, which meet the requirement of the minimum threshold that is 2, then, the check on the condition `signatures.length < _threshold` returns true, which results in a revert.

In a nutshell, in the above scenario, the number of approved signatures matches the requirement of the minimum threshold `_minimumThreshold`, but does not match the threshold `_threshold`.

File(s) Affected

contracts/DLCManager.sol #359-377

```
    function setThreshold(uint16 newThreshold) external onlyAdmin {
        if (newThreshold < _minimumThreshold)
            revert ThresholdTooLow(_minimumThreshold);
        _threshold = newThreshold;
        emit SetThreshold(newThreshold);
    }

    function addApprovedSigner(address signer) external onlyAdmin {
        _approvedSigners[signer] = true;
        _signerCount++;
    }

    function removeApprovedSigner(address signer) external onlyAdmin {
        if (_signerCount == _minimumThreshold)
            revert ThresholdMinimumReached(_minimumThreshold);
        if (!_approvedSigners[signer]) revert SignerNotApproved(signer);
        _approvedSigners[signer] = false;
        _signerCount--;
    }
```

contracts/DLCManager.sol #163-163

```
        if (signatures.length < _threshold) revert NotEnoughSignatures();
```

Recommendation

Consider checking the thresholds design, and ensuring the minimum threshold meets the requirement of the `_attestorMultisigIsValid` function.

Alleviation Fixed

The team solved this issue by adding a check between the `threshold` and the `_minimumThreshold` in the commit 08ad24555bea64d5a678f1a68c88165af4922217.

5. Upgradeable contracts missing a storage gap variable `__gap[50]`

Low risk   Security Analyzer

For the PR(https://github.com/DLC-link/dlc-solidity/pull/47/files), the contract `DLCBTC`(https://github.com/DLC-link/dlc-solidity/blob/4a778ca4015be74775e6f8afab94d5261ffa37c6/contracts/DLCBTC.sol#L23) misses the corresponding storage gap variable `__gap[50]` for the future upgradeable.

Storage Gaps | Openzepplin: Storage gaps are empty reserved space in storage that is put in place in Upgradeable contracts. It allows us to freely add new state variables in the future without compromising the storage compatibility with existing deployments.

File(s) Affected

Recommendation

Consider adding storage gaps for upgradeable contracts.

Alleviation Fixed

The finding is addressed in the commit 9eb8411ede3befe856f34468bf8f84153a3ccc38

Informational (5)

1. Lack of validating the `_threshold`

Informational   Security Analyzer

The `setThreshold` function checks that the `newThreshold` aka the `_threshold` should equal to or be greater than the `_minimumThreshold`.

However, the `initialize` function lacks checking if the `_threshold` is less than the `_minimumThreshold`, which may receive invalid values for `_threshold` and `_minimumThreshold`.

File(s) Affected

contracts/DLCManager.sol #102-111

```
    function initialize(
        address adminAddress,
        uint16 threshold
    ) public initializer {
        __AccessControlDefaultAdminRules_init(2 days, adminAddress);
        _grantRole(DLC_ADMIN_ROLE, adminAddress);
        _threshold = threshold;
        _index = 0;
        _minimumThreshold = 2;
    }
```

Recommendation

Recommend validating the `_threshold` from the `initialize` function so as to be consistent with the logic of the `setThreshold` function.

Alleviation Fixed

The team fixed this issue by adding check on the `threshold`, in the commit 08ad24555bea64d5a678f1a68c88165af4922217.

2. Gas optimazation

Informational Security Analyzer

The `getFundedTxIds` function repeatedly read the storage variable `_index`, which cost many gas, due to the read of storage variable is more expensive than that of read of the memory variable, epecially the `for` loop reads the `_index` mutiple times.

File(s) Affected

contracts/DLCManager.sol #332-334

```
        string[] memory _fundedTxIds = new string[](_index);
        uint256 _fundedTxIdsCount = 0;
        for (uint256 i = 0; i < _index; i++) {
```

Recommendation

Consider caching the `_index` with a memory variable to save gas.

Alleviation Fixed

The team fixed this issue by refactoring codes, in the commit a5ee45262973ac0d80e0894c59787a8d076b0ad5

3. Combining the chain id and contract address when calculating the UUID

Informational Security Analyzer

In order to keep the UUID unique across multiple chains and multiple contract, it is recommended taking the chain id and current contract address into account when calculating the UUID, as DLC.link will support multiple EVM compatible chains.

File(s) Affected

contracts/DLCManager.sol #142-150

```
    function _generateUUID(
        address sender,
        uint256 nonce
    ) private view returns (bytes32) {
        return
            keccak256(
                abi.encodePacked(sender, nonce, blockhash(block.number - 1))
            );
    }
```

Recommendation

Recommend combining the chain id and current contract address when calculating the UUID.

Alleviation Acknowledged

The team mitigated this finding by involving the chain id, in the calculation of UUID, in the commit 1e7b04de83dadba8aa4bd46b264dbc8729c2e163.

4. Lack of the fee rate boundary

Informational Security Analyzer

The functions `setMintFeeRate`, `setBtcMintFeeRate`, and `setBtcRedeemFeeRate`, update the fee rates `mintFeeRate`, `btcMintFeeRate`, and `btcRedeemFeeRate`. However, there is no boundary for their values, which may result in unexpected results. E.g. if the `mintFeeRate` is 10000, the recipient will not gain any token.

File(s) Affected

contracts/TokenManager.sol #327-344

```
    function setMintFeeRate(uint256 newMintFeeRate) external onlyDLCAdmin {
        mintFeeRate = newMintFeeRate;
        emit SetMintFeeRate(newMintFeeRate);
    }

    function setBtcMintFeeRate(
        uint256 newBtcMintFeeRate
    ) external onlyDLCAdmin {
        btcMintFeeRate = newBtcMintFeeRate;
        emit SetBtcMintFeeRate(newBtcMintFeeRate);
    }

    function setBtcRedeemFeeRate(
        uint256 newBtcRedeemFeeRate
    ) external onlyDLCAdmin {
        btcRedeemFeeRate = newBtcRedeemFeeRate;
        emit SetBtcRedeemFeeRate(newBtcRedeemFeeRate);
    }
```

Recommendation

Recommend adding fee rate boundary.

Alleviation Fixed

The team fixed this finding by adding the boundary check on the fees, in the commit c00c66da585a4facad80041af8e966a081c62fad.

5. Missing emit event

Informational Security Analyzer

For the PR(https://github.com/DLC-link/dlc-solidity/pull/47/files), functions, blacklist, and unblacklist(https://github.com/DLC-link/dlc-solidity/blob/4a778ca4015be74775e6f8afab94d5261ffa37c6/contracts/DLCBTC.sol#L58-L62) update state variables are recommended to emit event, which is good for tracking states' update.

File(s) Affected

Recommendation

Emit event for the above key functions.

Alleviation Fixed

The finding is addressed in the commit 9eb8411ede3befe856f34468bf8f84153a3ccc38

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