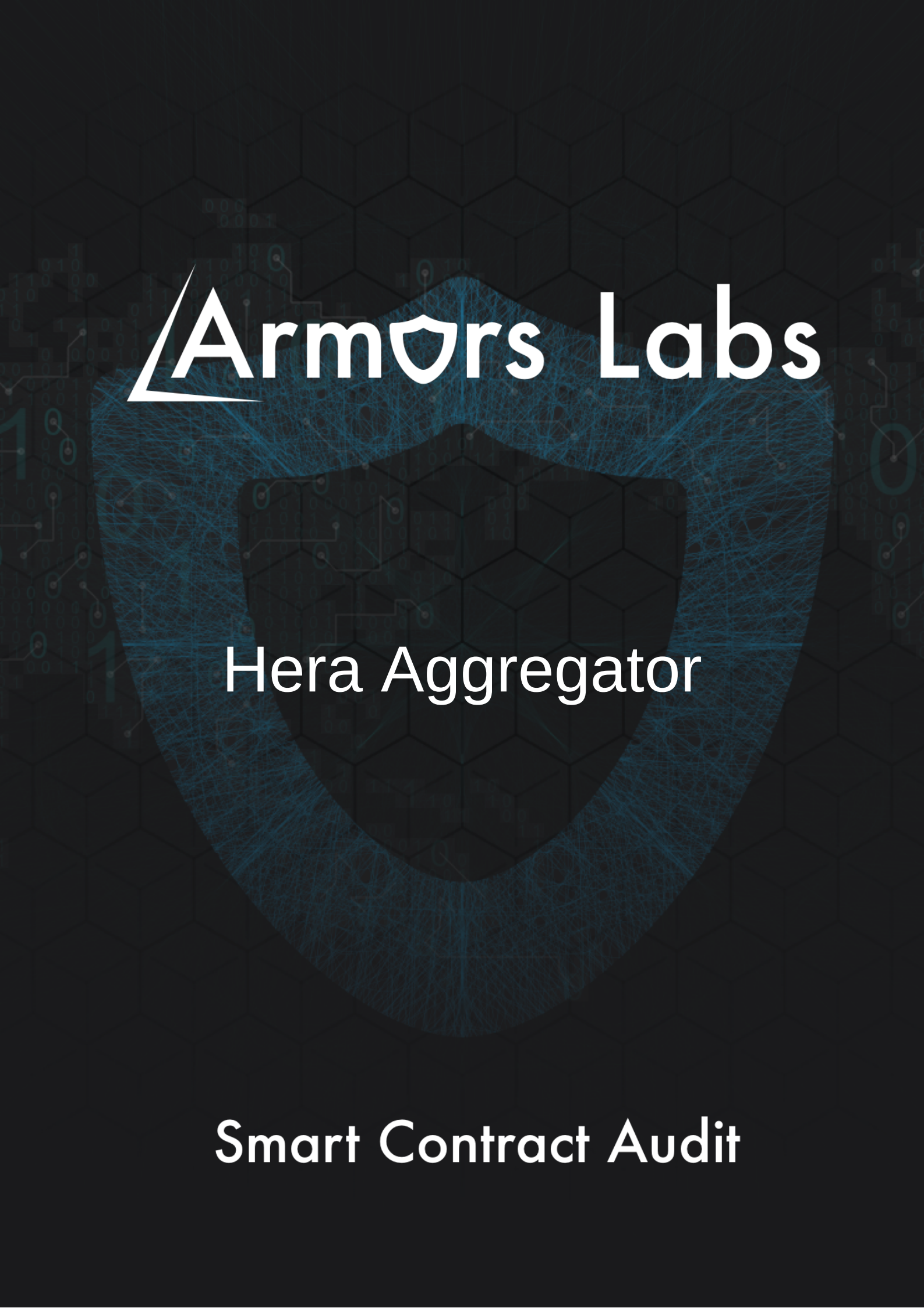
Armors Labs
Hera Aggregator
Smart Contract Audit

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Hera Aggregator Audit Summary

Project name : Hera Aggregator Contract

Project address: None

Code URL : https://andromeda-explorer.metis.io/address/0xAfCB0803F96dC1e9768d14ce55b1a46b26deb24c/contracts

Commit : None

Project target : Hera Aggregator Contract Audit

Blockchain : Metis

Test result : PASSED

Audit Info

Audit NO : 0X202203310026

Audit Team : Armors Labs

Audit Proofreading: https://armors.io/#project-cases

Hera Aggregator Audit

The Hera Aggregator team asked us to review and audit their Hera Aggregator contract. We looked at the code and now publish our results.

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

Document information

Name	Auditor	Version	Date
Hera Aggregator Audit	Rock, Sophia, Rushairer, Rico, David, Alice	1.0.0	2022-03-31

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 Hera Aggregator 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 3 months from the date of output.

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Audited target file

file	md5
Hera Aggregator.sol	3af35d25e684fa135861eee4020ee4bc

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 Blockchain Currency	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

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Vulnerability	status
Block Timestamp Manipulation	safe
Constructors with Care	safe
Unintialised Storage Pointers	safe
Floating Points and Numerical Precision	safe
tx.origin Authentication	safe
Permission restrictions	safe

Contract file

```
// File: @openzeppelin/contracts/utils/Address.sol


// OpenZeppelin Contracts (last updated v4.5.0) (utils/Address.sol)

pragma solidity ^0.8.1;

/**
 * @dev Collection of functions related to the address type
 */
library Address {
    /**
     * @dev Returns true if `account` is a contract.
     *
     * [IMPORTANT]
     * ====
     * It is unsafe to assume that an address for which this function returns
     * false is an externally-owned account (EOA) and not a contract.
     *
     * Among others, `isContract` will return false for the following
     * types of addresses:
     *
     *  - an externally-owned account
     *  - a contract in construction
     *  - an address where a contract will be created
     *  - an address where a contract lived, but was destroyed
     * ====
     *
     * [IMPORTANT]
     * ====
     * You shouldn't rely on `isContract` to protect against flash loan attacks!
     *
     * Preventing calls from contracts is highly discouraged. It breaks composability, breaks support
     * like Gnosis Safe, and does not provide security since it can be circumvented by calling from a
     * constructor.
     * ====
     */
    function isContract(address account) internal view returns (bool) {
        // This method relies on extcodesize/address.code.length, which returns 0
        // for contracts in construction, since the code is only stored at the end
        // of the constructor execution.

        return account.code.length > 0;
    }
```

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```
    /**
     * @dev Replacement for Solidity's `transfer`: sends `amount` wei to
     * `recipient`, forwarding all available gas and reverting on errors.
     *
     * https://eips.ethereum.org/EIPS/eip-1884[EIP1884] increases the gas cost
     * of certain opcodes, possibly making contracts go over the 2300 gas limit
     * imposed by `transfer`, making them unable to receive funds via
     * `transfer`. {sendValue} removes this limitation.
     *
     * https://diligence.consensys.net/posts/2019/09/stop-using-soliditys-transfer-now/[Learn more].
     *
     * IMPORTANT: because control is transferred to `recipient`, care must be
     * taken to not create reentrancy vulnerabilities. Consider using
     * {ReentrancyGuard} or the
     * https://solidity.readthedocs.io/en/v0.5.11/security-considerations.html#use-the-checks-effects
     */
    function sendValue(address payable recipient, uint256 amount) internal {
        require(address(this).balance >= amount, "Address: insufficient balance");

        (bool success, ) = recipient.call{value: amount}("");
        require(success, "Address: unable to send value, recipient may have reverted");
    }

    /**
     * @dev Performs a Solidity function call using a low level `call`. A
     * plain `call` is an unsafe replacement for a function call: use this
     * function instead.
     *
     * If `target` reverts with a revert reason, it is bubbled up by this
     * function (like regular Solidity function calls).
     *
     * Returns the raw returned data. To convert to the expected return value,
     * use https://solidity.readthedocs.io/en/latest/units-and-global-variables.html?highlight=abi.de
     *
     * Requirements:
     *
     * - `target` must be a contract.
     * - calling `target` with `data` must not revert.
     *
     * _Available since v3.1._
     */
    function functionCall(address target, bytes memory data) internal returns (bytes memory) {
        return functionCall(target, data, "Address: low-level call failed");
    }

    /**
     * @dev Same as {xref-Address-functionCall-address-bytes-}[`functionCall`], but with
     * `errorMessage` as a fallback revert reason when `target` reverts.
     *
     * _Available since v3.1._
     */
    function functionCall(
        address target,
        bytes memory data,
        string memory errorMessage
    ) internal returns (bytes memory) {
        return functionCallWithValue(target, data, 0, errorMessage);
    }

    /**
     * @dev Same as {xref-Address-functionCall-address-bytes-}[`functionCall`],
     * but also transferring `value` wei to `target`.
     *
     * Requirements:
     *
     * - the calling contract must have an ETH balance of at least `value`.
```

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```
     * - the called Solidity function must be `payable`.
     *
     * _Available since v3.1._
     */
    function functionCallWithValue(
        address target,
        bytes memory data,
        uint256 value
    ) internal returns (bytes memory) {
        return functionCallWithValue(target, data, value, "Address: low-level call with value failed"
    }

    /**
     * @dev Same as {xref-Address-functionCallWithValue-address-bytes-uint256-}[`functionCallWithValu
     * with `errorMessage` as a fallback revert reason when `target` reverts.
     *
     * _Available since v3.1._
     */
    function functionCallWithValue(
        address target,
        bytes memory data,
        uint256 value,
        string memory errorMessage
    ) internal returns (bytes memory) {
        require(address(this).balance >= value, "Address: insufficient balance for call");
        require(isContract(target), "Address: call to non-contract");

        (bool success, bytes memory returndata) = target.call{value: value}(data);
        return verifyCallResult(success, returndata, errorMessage);
    }

    /**
     * @dev Same as {xref-Address-functionCall-address-bytes-}[`functionCall`],
     * but performing a static call.
     *
     * _Available since v3.3._
     */
    function functionStaticCall(address target, bytes memory data) internal view returns (bytes memor
        return functionStaticCall(target, data, "Address: low-level static call failed");
    }

    /**
     * @dev Same as {xref-Address-functionCall-address-bytes-string-}[`functionCall`],
     * but performing a static call.
     *
     * _Available since v3.3._
     */
    function functionStaticCall(
        address target,
        bytes memory data,
        string memory errorMessage
    ) internal view returns (bytes memory) {
        require(isContract(target), "Address: static call to non-contract");

        (bool success, bytes memory returndata) = target.staticcall(data);
        return verifyCallResult(success, returndata, errorMessage);
    }

    /**
     * @dev Same as {xref-Address-functionCall-address-bytes-}[`functionCall`],
     * but performing a delegate call.
     *
     * _Available since v3.4._
     */
    function functionDelegateCall(address target, bytes memory data) internal returns (bytes memory)
        return functionDelegateCall(target, data, "Address: low-level delegate call failed");
```

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```
    }

    /**
     * @dev Same as {xref-Address-functionCall-address-bytes-string-}[`functionCall`],
     * but performing a delegate call.
     *
     * _Available since v3.4._
     */
    function functionDelegateCall(
        address target,
        bytes memory data,
        string memory errorMessage
    ) internal returns (bytes memory) {
        require(isContract(target), "Address: delegate call to non-contract");

        (bool success, bytes memory returndata) = target.delegatecall(data);
        return verifyCallResult(success, returndata, errorMessage);
    }

    /**
     * @dev Tool to verifies that a low level call was successful, and revert if it wasn't, either by
     * revert reason using the provided one.
     *
     * _Available since v4.3._
     */
    function verifyCallResult(
        bool success,
        bytes memory returndata,
        string memory errorMessage
    ) internal pure returns (bytes memory) {
        if (success) {
            return returndata;
        } else {
            // Look for revert reason and bubble it up if present
            if (returndata.length > 0) {
                // The easiest way to bubble the revert reason is using memory via assembly

                assembly {
                    let returndata_size := mload(returndata)
                    revert(add(32, returndata), returndata_size)
                }
            } else {
                revert(errorMessage);
            }
        }
    }
}

// File: @openzeppelin/contracts/token/ERC20/IERC20.sol


// OpenZeppelin Contracts (last updated v4.5.0) (token/ERC20/IERC20.sol)

pragma solidity ^0.8.0;

/**
 * @dev Interface of the ERC20 standard as defined in the EIP.
 */
interface IERC20 {
    /**
     * @dev Returns the amount of tokens in existence.
     */
    function totalSupply() external view returns (uint256);

    /**
     * @dev Returns the amount of tokens owned by `account`.
```

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```
     */
    function balanceOf(address account) external view returns (uint256);

    /**
     * @dev Moves `amount` tokens from the caller's account to `to`.
     *
     * Returns a boolean value indicating whether the operation succeeded.
     *
     * Emits a {Transfer} event.
     */
    function transfer(address to, uint256 amount) external returns (bool);

    /**
     * @dev Returns the remaining number of tokens that `spender` will be
     * allowed to spend on behalf of `owner` through {transferFrom}. This is
     * zero by default.
     *
     * This value changes when {approve} or {transferFrom} are called.
     */
    function allowance(address owner, address spender) external view returns (uint256);

    /**
     * @dev Sets `amount` as the allowance of `spender` over the caller's tokens.
     *
     * Returns a boolean value indicating whether the operation succeeded.
     *
     * IMPORTANT: Beware that changing an allowance with this method brings the risk
     * that someone may use both the old and the new allowance by unfortunate
     * transaction ordering. One possible solution to mitigate this race
     * condition is to first reduce the spender's allowance to 0 and set the
     * desired value afterwards:
     * https://github.com/ethereum/EIPs/issues/20#issuecomment-263524729
     *
     * Emits an {Approval} event.
     */
    function approve(address spender, uint256 amount) external returns (bool);

    /**
     * @dev Moves `amount` tokens from `from` to `to` using the
     * allowance mechanism. `amount` is then deducted from the caller's
     * allowance.
     *
     * Returns a boolean value indicating whether the operation succeeded.
     *
     * Emits a {Transfer} event.
     */
    function transferFrom(
        address from,
        address to,
        uint256 amount
    ) external returns (bool);

    /**
     * @dev Emitted when `value` tokens are moved from one account (`from`) to
     * another (`to`).
     *
     * Note that `value` may be zero.
     */
    event Transfer(address indexed from, address indexed to, uint256 value);

    /**
     * @dev Emitted when the allowance of a `spender` for an `owner` is set by
     * a call to {approve}. `value` is the new allowance.
     */
    event Approval(address indexed owner, address indexed spender, uint256 value);
}
```

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```
// File: @openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol


// OpenZeppelin Contracts v4.4.1 (token/ERC20/utils/SafeERC20.sol)

pragma solidity ^0.8.0;



/**
 * @title SafeERC20
 * @dev Wrappers around ERC20 operations that throw on failure (when the token
 * contract returns false). Tokens that return no value (and instead revert or
 * throw on failure) are also supported, non-reverting calls are assumed to be
 * successful.
 * To use this library you can add a `using SafeERC20 for IERC20;` statement to your contract,
 * which allows you to call the safe operations as `token.safeTransfer(...)`, etc.
 */
library SafeERC20 {
    using Address for address;

    function safeTransfer(
        IERC20 token,
        address to,
        uint256 value
    ) internal {
        _callOptionalReturn(token, abi.encodeWithSelector(token.transfer.selector, to, value));
    }

    function safeTransferFrom(
        IERC20 token,
        address from,
        address to,
        uint256 value
    ) internal {
        _callOptionalReturn(token, abi.encodeWithSelector(token.transferFrom.selector, from, to, valu
    }

    /**
     * @dev Deprecated. This function has issues similar to the ones found in
     * {IERC20-approve}, and its usage is discouraged.
     *
     * Whenever possible, use {safeIncreaseAllowance} and
     * {safeDecreaseAllowance} instead.
     */
    function safeApprove(
        IERC20 token,
        address spender,
        uint256 value
    ) internal {
        // safeApprove should only be called when setting an initial allowance,
        // or when resetting it to zero. To increase and decrease it, use
        // 'safeIncreaseAllowance' and 'safeDecreaseAllowance'
        require(
            (value == 0) || (token.allowance(address(this), spender) == 0),
            "SafeERC20: approve from non-zero to non-zero allowance"
        );
        _callOptionalReturn(token, abi.encodeWithSelector(token.approve.selector, spender, value));
    }

    function safeIncreaseAllowance(
        IERC20 token,
        address spender,
        uint256 value
    ) internal {
```

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```
        uint256 newAllowance = token.allowance(address(this), spender) + value;
        _callOptionalReturn(token, abi.encodeWithSelector(token.approve.selector, spender, newAllowan
    }

    function safeDecreaseAllowance(
        IERC20 token,
        address spender,
        uint256 value
    ) internal {
    unchecked {
        uint256 oldAllowance = token.allowance(address(this), spender);
        require(oldAllowance >= value, "SafeERC20: decreased allowance below zero");
        uint256 newAllowance = oldAllowance - value;
        _callOptionalReturn(token, abi.encodeWithSelector(token.approve.selector, spender, newAllowan
    }
    }

    /**
     * @dev Imitates a Solidity high-level call (i.e. a regular function call to a contract), relaxin
     * on the return value: the return value is optional (but if data is returned, it must not be fal
     * @param token The token targeted by the call.
     * @param data The call data (encoded using abi.encode or one of its variants).
     */
    function _callOptionalReturn(IERC20 token, bytes memory data) private {
        // We need to perform a low level call here, to bypass Solidity's return data size checking m
        // we're implementing it ourselves. We use {Address.functionCall} to perform this call, which
        // the target address contains contract code and also asserts for success in the low-level ca

        bytes memory returndata = address(token).functionCall(data, "SafeERC20: low-level call failed
        if (returndata.length > 0) {
            // Return data is optional
            require(abi.decode(returndata, (bool)), "SafeERC20: ERC20 operation did not succeed");
        }
    }
}

// File: @openzeppelin/contracts/utils/math/SafeMath.sol


// OpenZeppelin Contracts v4.4.1 (utils/math/SafeMath.sol)

pragma solidity ^0.8.0;

// CAUTION
// This version of SafeMath should only be used with Solidity 0.8 or later,
// because it relies on the compiler's built in overflow checks.

/**
 * @dev Wrappers over Solidity's arithmetic operations.
 *
 * NOTE: `SafeMath` is generally not needed starting with Solidity 0.8, since the compiler
 * now has built in overflow checking.
 */
library SafeMath {
    /**
     * @dev Returns the addition of two unsigned integers, with an overflow flag.
     *
     * _Available since v3.4._
     */
    function tryAdd(uint256 a, uint256 b) internal pure returns (bool, uint256) {
    unchecked {
        uint256 c = a + b;
        if (c < a) return (false, 0);
        return (true, c);
    }
    }
```

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```
/**
 * @dev Returns the substraction of two unsigned integers, with an overflow flag.
 *
 * _Available since v3.4._
 */
function trySub(uint256 a, uint256 b) internal pure returns (bool, uint256) {
unchecked {
    if (b > a) return (false, 0);
    return (true, a - b);
}
}

/**
 * @dev Returns the multiplication of two unsigned integers, with an overflow flag.
 *
 * _Available since v3.4._
 */
function tryMul(uint256 a, uint256 b) internal pure returns (bool, uint256) {
unchecked {
    // Gas optimization: this is cheaper than requiring 'a' not being zero, but the
    // benefit is lost if 'b' is also tested.
    // See: https://github.com/OpenZeppelin/openzeppelin-contracts/pull/522
    if (a == 0) return (true, 0);
    uint256 c = a * b;
    if (c / a != b) return (false, 0);
    return (true, c);
}
}

/**
 * @dev Returns the division of two unsigned integers, with a division by zero flag.
 *
 * _Available since v3.4._
 */
function tryDiv(uint256 a, uint256 b) internal pure returns (bool, uint256) {
unchecked {
    if (b == 0) return (false, 0);
    return (true, a / b);
}
}

/**
 * @dev Returns the remainder of dividing two unsigned integers, with a division by zero flag.
 *
 * _Available since v3.4._
 */
function tryMod(uint256 a, uint256 b) internal pure returns (bool, uint256) {
unchecked {
    if (b == 0) return (false, 0);
    return (true, a % b);
}
}

/**
 * @dev Returns the addition of two unsigned integers, reverting on
 * overflow.
 *
 * Counterpart to Solidity's `+` operator.
 *
 * Requirements:
 *
 * - Addition cannot overflow.
 */
function add(uint256 a, uint256 b) internal pure returns (uint256) {
    return a + b;
```

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```
    }

    /**
     * @dev Returns the subtraction of two unsigned integers, reverting on
     * overflow (when the result is negative).
     *
     * Counterpart to Solidity's `-` operator.
     *
     * Requirements:
     *
     * - Subtraction cannot overflow.
     */
    function sub(uint256 a, uint256 b) internal pure returns (uint256) {
        return a - b;
    }

    /**
     * @dev Returns the multiplication of two unsigned integers, reverting on
     * overflow.
     *
     * Counterpart to Solidity's `*` operator.
     *
     * Requirements:
     *
     * - Multiplication cannot overflow.
     */
    function mul(uint256 a, uint256 b) internal pure returns (uint256) {
        return a * b;
    }

    /**
     * @dev Returns the integer division of two unsigned integers, reverting on
     * division by zero. The result is rounded towards zero.
     *
     * Counterpart to Solidity's `/` operator.
     *
     * Requirements:
     *
     * - The divisor cannot be zero.
     */
    function div(uint256 a, uint256 b) internal pure returns (uint256) {
        return a / b;
    }

    /**
     * @dev Returns the remainder of dividing two unsigned integers. (unsigned integer modulo),
     * reverting when dividing by zero.
     *
     * Counterpart to Solidity's `%` operator. This function uses a `revert`
     * opcode (which leaves remaining gas untouched) while Solidity uses an
     * invalid opcode to revert (consuming all remaining gas).
     *
     * Requirements:
     *
     * - The divisor cannot be zero.
     */
    function mod(uint256 a, uint256 b) internal pure returns (uint256) {
        return a % b;
    }

    /**
     * @dev Returns the subtraction of two unsigned integers, reverting with custom message on
     * overflow (when the result is negative).
     *
     * CAUTION: This function is deprecated because it requires allocating memory for the error
     * message unnecessarily. For custom revert reasons use {trySub}.
```

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```
     *
     * Counterpart to Solidity's `-` operator.
     *
     * Requirements:
     *
     * - Subtraction cannot overflow.
     */
    function sub(
        uint256 a,
        uint256 b,
        string memory errorMessage
    ) internal pure returns (uint256) {
    unchecked {
        require(b <= a, errorMessage);
        return a - b;
    }
    }

    /**
     * @dev Returns the integer division of two unsigned integers, reverting with custom message on
     * division by zero. The result is rounded towards zero.
     *
     * Counterpart to Solidity's `/` operator. Note: this function uses a
     * `revert` opcode (which leaves remaining gas untouched) while Solidity
     * uses an invalid opcode to revert (consuming all remaining gas).
     *
     * Requirements:
     *
     * - The divisor cannot be zero.
     */
    function div(
        uint256 a,
        uint256 b,
        string memory errorMessage
    ) internal pure returns (uint256) {
    unchecked {
        require(b > 0, errorMessage);
        return a / b;
    }
    }

    /**
     * @dev Returns the remainder of dividing two unsigned integers. (unsigned integer modulo),
     * reverting with custom message when dividing by zero.
     *
     * CAUTION: This function is deprecated because it requires allocating memory for the error
     * message unnecessarily. For custom revert reasons use {tryMod}.
     *
     * Counterpart to Solidity's `%` operator. This function uses a `revert`
     * opcode (which leaves remaining gas untouched) while Solidity uses an
     * invalid opcode to revert (consuming all remaining gas).
     *
     * Requirements:
     *
     * - The divisor cannot be zero.
     */
    function mod(
        uint256 a,
        uint256 b,
        string memory errorMessage
    ) internal pure returns (uint256) {
    unchecked {
        require(b > 0, errorMessage);
        return a % b;
    }
    }
```

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```
}

// File: @openzeppelin/contracts/security/ReentrancyGuard.sol


// OpenZeppelin Contracts v4.4.1 (security/ReentrancyGuard.sol)

pragma solidity ^0.8.0;

/**
 * @dev Contract module that helps prevent reentrant calls to a function.
 *
 * Inheriting from `ReentrancyGuard` will make the {nonReentrant} modifier
 * available, which can be applied to functions to make sure there are no nested
 * (reentrant) calls to them.
 *
 * Note that because there is a single `nonReentrant` guard, functions marked as
 * `nonReentrant` may not call one another. This can be worked around by making
 * those functions `private`, and then adding `external` `nonReentrant` entry
 * points to them.
 *
 * TIP: If you would like to learn more about reentrancy and alternative ways
 * to protect against it, check out our blog post
 * https://blog.openzeppelin.com/reentrancy-after-istanbul/[Reentrancy After Istanbul].
 */
abstract contract ReentrancyGuard {
    // Booleans are more expensive than uint256 or any type that takes up a full
    // word because each write operation emits an extra SLOAD to first read the
    // slot's contents, replace the bits taken up by the boolean, and then write
    // back. This is the compiler's defense against contract upgrades and
    // pointer aliasing, and it cannot be disabled.

    // The values being non-zero value makes deployment a bit more expensive,
    // but in exchange the refund on every call to nonReentrant will be lower in
    // amount. Since refunds are capped to a percentage of the total
    // transaction's gas, it is best to keep them low in cases like this one, to
    // increase the likelihood of the full refund coming into effect.
    uint256 private constant _NOT_ENTERED = 1;
    uint256 private constant _ENTERED = 2;

    uint256 private _status;

    constructor() {
        _status = _NOT_ENTERED;
    }

    /**
     * @dev Prevents a contract from calling itself, directly or indirectly.
     * Calling a `nonReentrant` function from another `nonReentrant`
     * function is not supported. It is possible to prevent this from happening
     * by making the `nonReentrant` function external, and making it call a
     * `private` function that does the actual work.
     */
    modifier nonReentrant() {
        // On the first call to nonReentrant, _notEntered will be true
        require(_status != _ENTERED, "ReentrancyGuard: reentrant call");

        // Any calls to nonReentrant after this point will fail
        _status = _ENTERED;

        _;

        // By storing the original value once again, a refund is triggered (see
        // https://eips.ethereum.org/EIPS/eip-2200)
        _status = _NOT_ENTERED;
    }
```

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```
}

// File: @openzeppelin/contracts/utils/Context.sol


// OpenZeppelin Contracts v4.4.1 (utils/Context.sol)

pragma solidity ^0.8.0;

/**
 * @dev Provides information about the current execution context, including the
 * sender of the transaction and its data. While these are generally available
 * via msg.sender and msg.data, they should not be accessed in such a direct
 * manner, since when dealing with meta-transactions the account sending and
 * paying for execution may not be the actual sender (as far as an application
 * is concerned).
 *
 * This contract is only required for intermediate, library-like contracts.
 */
abstract contract Context {
    function _msgSender() internal view virtual returns (address) {
        return msg.sender;
    }

    function _msgData() internal view virtual returns (bytes calldata) {
        return msg.data;
    }
}

// File: @openzeppelin/contracts/access/Ownable.sol


// OpenZeppelin Contracts v4.4.1 (access/Ownable.sol)

pragma solidity ^0.8.0;


/**
 * @dev Contract module which provides a basic access control mechanism, where
 * there is an account (an owner) that can be granted exclusive access to
 * specific functions.
 *
 * By default, the owner account will be the one that deploys the contract. This
 * can later be changed with {transferOwnership}.
 *
 * This module is used through inheritance. It will make available the modifier
 * `onlyOwner`, which can be applied to your functions to restrict their use to
 * the owner.
 */
abstract contract Ownable is Context {
    address private _owner;

    event OwnershipTransferred(address indexed previousOwner, address indexed newOwner);

    /**
     * @dev Initializes the contract setting the deployer as the initial owner.
     */
    constructor() {
        _transferOwnership(_msgSender());
    }

    /**
     * @dev Returns the address of the current owner.
     */
    function owner() public view virtual returns (address) {
        return _owner;
```

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```
    }

    /**
     * @dev Throws if called by any account other than the owner.
     */
    modifier onlyOwner() {
        require(owner() == _msgSender(), "Ownable: caller is not the owner");
        _;
    }

    /**
     * @dev Leaves the contract without owner. It will not be possible to call
     * `onlyOwner` functions anymore. Can only be called by the current owner.
     *
     * NOTE: Renouncing ownership will leave the contract without an owner,
     * thereby removing any functionality that is only available to the owner.
     */
    function renounceOwnership() public virtual onlyOwner {
        _transferOwnership(address(0));
    }

    /**
     * @dev Transfers ownership of the contract to a new account (`newOwner`).
     * Can only be called by the current owner.
     */
    function transferOwnership(address newOwner) public virtual onlyOwner {
        require(newOwner != address(0), "Ownable: new owner is the zero address");
        _transferOwnership(newOwner);
    }

    /**
     * @dev Transfers ownership of the contract to a new account (`newOwner`).
     * Internal function without access restriction.
     */
    function _transferOwnership(address newOwner) internal virtual {
        address oldOwner = _owner;
        _owner = newOwner;
        emit OwnershipTransferred(oldOwner, newOwner);
    }
}

// File: contracts/HeraAggregatorV13.sol


pragma solidity ^0.8.10;




contract HeraAggregatorV1 is Ownable, ReentrancyGuard {
    using SafeMath for uint256;

    address private METIS = 0xDeadDeAddeAddEAddeadDEaDDEAdDeaDDeAD0000;
    address private ZERO_ADDRESS = 0x0000000000000000000000000000000000000000;

    address payable feeRecipientAddress;
    address private feeContractAddress;

    address payable public manager;
    mapping(address => bool) public supportedRouters;
    mapping(address => mapping(bytes4 => bool)) public supportedSelectors;


    struct PathData {
        address tokenIn;
```

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```
        address tokenOut;
        uint amountIn;
        uint amountOutMin;
        address router;
        bytes data;
    }

    event Swapped(
        address sender,
        address srcToken,
        address dstToken,
        uint256 spentAmount,
        uint256 returnAmount
    );

    constructor(address _feeContractAddress, address payable _feeRecipientAddress) payable {
        manager = payable(msg.sender);
        feeRecipientAddress = payable(_feeRecipientAddress);
        feeContractAddress = _feeContractAddress;
    }

    receive() external payable {}

    fallback() external payable {}

    function setFeeContractAddress(address _feeContractAddress) public onlyOwner{
        feeContractAddress = _feeContractAddress;
    }

    function setFeeRecipientAddress(address payable _feeRecipientAddress) public onlyOwner{
        feeRecipientAddress = _feeRecipientAddress;
    }

    function transferfee(address payable _to, uint _amount) private {
        uint amount = address(this).balance;
        uint feeAmount = _amount;
        if(amount >= _amount)
            feeAmount = amount;

        (bool success, ) = _to.call{value: feeAmount}("");
        require(success, "Failed to send Metis");
    }

    function transferfeetoken(address _to, uint _amount, address _tokenIn) private {
        uint amount = IERC20(_tokenIn).balanceOf(address(this));
        uint feeAmount = _amount;
        if(amount >= _amount)
            feeAmount = amount;
        SafeERC20.safeTransfer(IERC20(_tokenIn), _to, feeAmount);
    }

    function transfer(address payable _to, uint _amount) private {
        (bool success, ) = _to.call{value: _amount}("");
        require(success, "Failed to send Metis");
    }

    function rescueFunds(IERC20 token, uint256 amount) external onlyOwner {
        token.transfer(msg.sender, amount);
    }

    function destroy() external onlyOwner {
        selfdestruct(payable(msg.sender));
    }

    function setAvailableRouter(bool available, address router)
    public
```

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```
    onlyOwner
    {
        supportedRouters[router] = available;
    }

    function setRouterSelector(
        bytes4 selector,
        address router,
        bool available
    ) public onlyOwner {
        supportedSelectors[router][selector] = available;
    }

    function swap(address _tokenIn, address _tokenOut, uint256 _amountIn, uint256 _amountOut, PathDat
        require(_amountOut > 0, "AMOUNTOUT_ZERO");
        require(paths.length > 0, "PATH_EMPTY");

        if(_tokenIn != METIS)
            SafeERC20.safeTransferFrom(IERC20(_tokenIn),msg.sender, address(this), _amountIn);

        for(uint256 i; i < paths.length; i++){
            require(supportedRouters[paths[i].router], "UNSUPPORTED_ROUTER");
            require(supportedSelectors[paths[i].router][bytes4(paths[i].data)],"UNSUPPORTED_SELECTOR"
            bool success;
            bytes memory result;
            if(METIS == paths[i].tokenIn){
                (success,result) = address(paths[i].router).call{value: paths[i].amountIn}(paths[i].d
            }
            else {
                SafeERC20.safeApprove(IERC20(paths[i].tokenIn), address(paths[i].router), paths[i].am
                (success,result) = payable(paths[i].router).call(paths[i].data);
            }
            require(success, "SWAP_FAILED");
        }
        if(_tokenOut == METIS)
            transfer(payable(msg.sender), _amountOut);
        else
            SafeERC20.safeTransfer(IERC20(_tokenOut), msg.sender, _amountOut);

        IFeeCalled feecall = IFeeCalled(feeContractAddress);
        (uint256 fee, uint256 feeDivider) = feecall.getFee(msg.sender);
        require(fee <= 100 && feeDivider == 10000, "FEE_HIGH");
        uint256 feeAmount = _amountIn.mul(fee).div(feeDivider);
        if (feeAmount > 0) {
            if(_tokenIn == METIS)
                transferfee(feeRecipientAddress, feeAmount);
            else
                transferfeetoken(feeRecipientAddress, feeAmount, _tokenIn);
        }

        emit Swapped(
            msg.sender,
            _tokenIn,
            _tokenOut,
            _amountIn,
            _amountOut
        );

    }



}

interface IFeeCalled{
```

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```
    function getFee(address recipient) external returns (uint256, uint256);
}
```

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 Blockchain Currency, and as such often send Blockchain Currency to various external user addresses. The operation of calling external contracts, or sending Blockchain Currency 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 Blockchain Currency

- **Description:**
  Typically when Blockchain Currency 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 Blockchain Currency can exist in a contract without having executed any code. Contracts which rely on code execution for every Blockchain Currency sent to the contract can be vulnerable to attacks where Blockchain Currency is forcibly sent to a contract.
- **Detection results:**

  ```
  PASSED!
  ```

- **Security suggestion:** no.

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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 whBlockchain Currency 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

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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 Blockchain Currency 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.

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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 Blockchain Currency 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 that contained 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.

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- **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.

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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.

Permission restrictions

- **Description:**
  Contract managers who can control liquidity or pledge pools, etc., or impose unreasonable restrictions on other

users.

- **Detection results:**

```
PASSED!
```

- **Security suggestion:**
  no.

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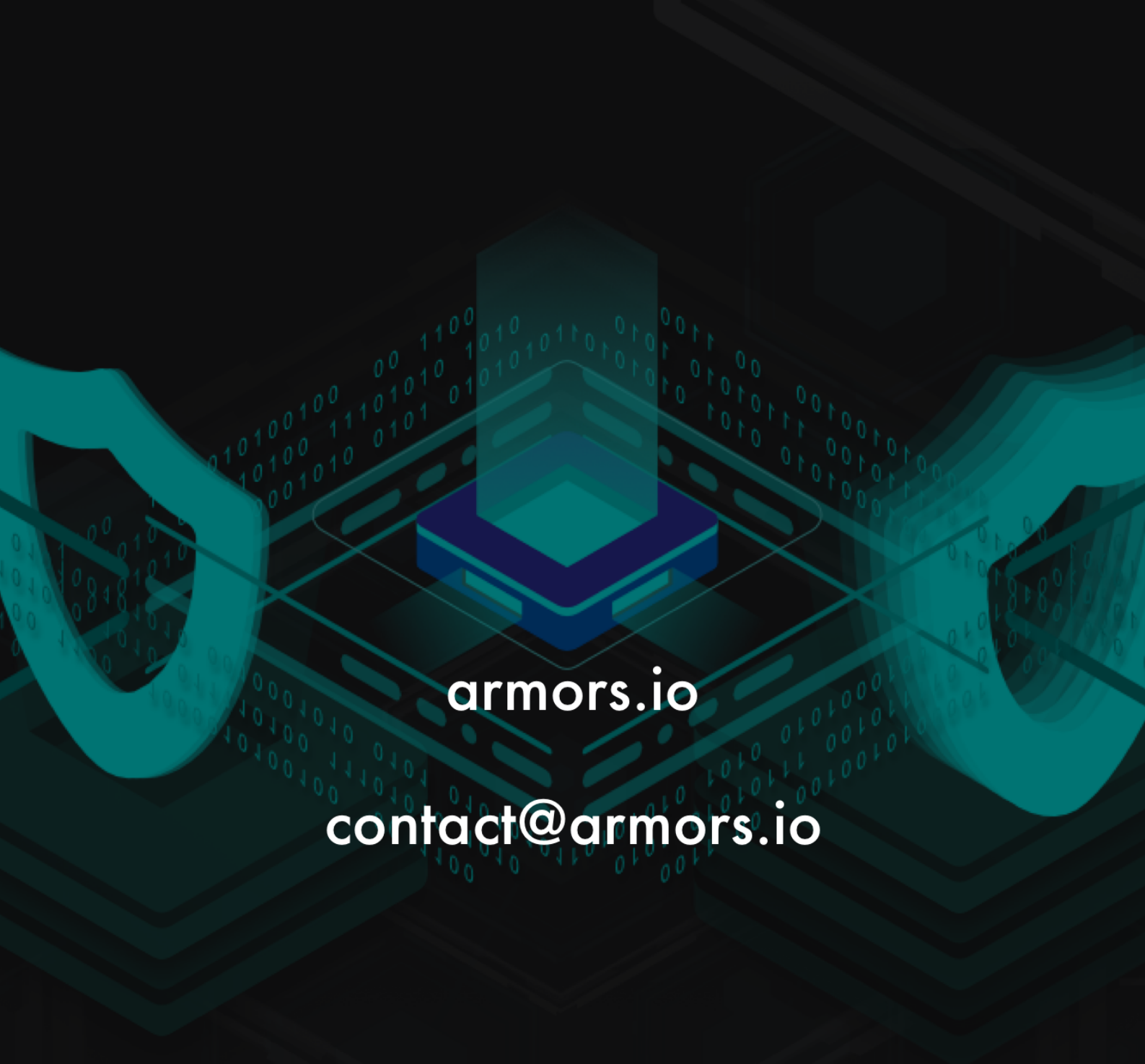

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