KNOWNSEC

Smart Contract Audit Report

Safe State

Low Risk

★★★★☆

Version description

Revised man	Revised content	Revised	version number	Reviewer
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Document information

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SfgToken Smart Contract Audit Report	V1.0	【SfgToken-DMSJ-20200922】	Open project team

Copyright statement

目录

1. Review

The effective testing time of this report is from **September 19,2020** to **September 22,2020**. During this period, the Knownsec engineers audited the safety and regulatory aspects of **SfgToken** smart contract code.

In this test, engineers comprehensively analyzed common vulnerabilities of smart contracts (Chapter 3) and It was discovered that reentrancy,transaction ordering dependence, adding tokens risk, so it's evaluated as **low-risk**.

The result of the safety auditing: Pass

Since the test process is carried out in a non-production environment, all the codes are the latest backups. We communicates with the relevant interface personnel, and the relevant test operations are performed under the controllable operation risk to avoid the risks during the test..

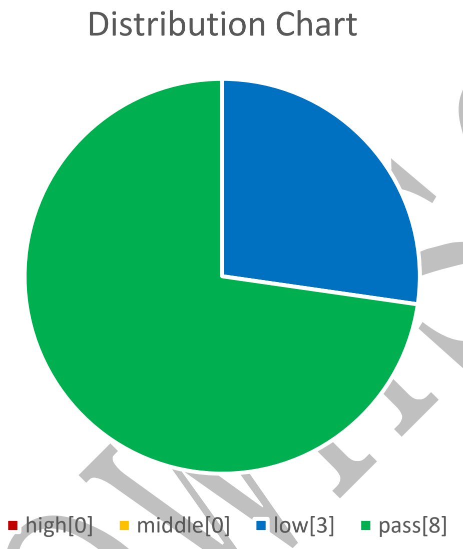
Target information for this test:

Module name	content
Token name	SfgToken
Code type	Token code
Code language	solidity

2. Analysis of code vulnerability

2.1. Distribution of vulnerability Levels

Vulnerability statistics			
high	Middle	low	pass
0	0	3	8



2.2. Audit result summary

Result			
Test project	Test content	status	description
Smart Contract	Reentrancy	Low	Check the call.value() function for security
	Arithmetic Issues	Pass	Check add and sub functions
	Access Control	Pass	Check the operation access control
	Unchecked Return Values For Low Level Calls	Pass	Check the currency conversion method.
	Bad Randomness	Pass	Check the unified content filter
	Transaction ordering dependence	Low	Check the transaction ordering dependence
	Denial of service attack detection	Pass	Check whether the code has a resource abuse problem when using a resource
	Logic design Flaw	Pass	Examine the security issues associated with business design in intelligent contract codes.
	USDT Fake Deposit Issue	Pass	Check for the existence of USDT Fake Deposit Issue
	Adding tokens	Low	It is detected whether there is a function in the token contract that may increase the total amounts of tokens
	Freezing accounts bypassed	Pass	It is detected whether there is an unverified token source account, an originating account, and whether the target account is frozen.

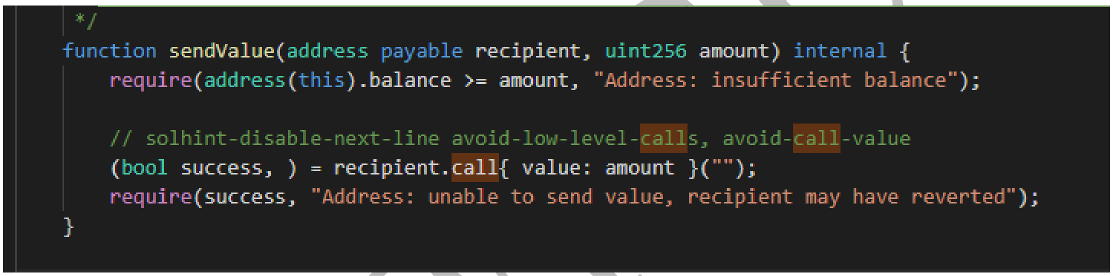
3. Result analysis

3.1. Reentrancy【Low】

The Reentrancy attack, probably the most famous Ethereum vulnerability， led to a hard fork of Ethereum.

When the low level call() function sends ether to the msg.sender address, it becomes vulnerable; if the address is a smart contract, the payment will trigger its fallback function with what's left of the transaction gas.

Detection results: After testing, there are related call external contract calls in the smart contract code.



```
 */
function sendValue(address payable recipient, uint256 amount) internal {
    require(address(this).balance >= amount, "Address: insufficient balance");

    // solhint-disable-next-line avoid-low-level-calls, avoid-call-value
    (bool success, ) = recipient.call{ value: amount }("");
    require(success, "Address: unable to send value, recipient may have reverted");
}
```

Safety advice:

(1) Try to use send() and transfer() functions.

(2) If you use a low-level calling function like the call() function, you should perform the internal state change first, and then use the low-level calling function.

(3) Try to avoid calling external contracts when writing smart contracts.

3.2. Arithmetic Issues【Pass】

Also known as integer overflow and integer underflow. Solidity can handle up to 256 digits (2^256-1), The largest number increases by 1 will overflow to 0. Similarly, when the number is an unsigned type, 0 minus 1 will underflow to get the maximum numeric value.

Integer overflows and underflows are not a new class of vulnerability, but they are especially dangerous in smart contracts. Overflow can lead to incorrect results, especially if the probability is not expected, which may affect the reliability and security of the program.

Test results: No related vulnerabilities in smart contract code

Safety advice：None

3.3. Access Control【Pass】

Access Control issues are common in all programs,Also smart contracts. The famous Parity Wallet smart contract has been affected by this issue.

Test results: No related vulnerabilities in smart contract code

Safety advice：None。

3.4. Unchecked Return Values For Low Level Calls 【Pass】

Also known as or related to silent failing sends, unchecked-send. There are transfer methods such as transfer(), send(), and call.value() in Solidity and can be used to send Ether to an address. The difference is: transfer will be thrown when failed to send, and rollback; only 2300gas will be passed for call to prevent reentry attacks; send will return false if send fails; only 2300gas will be passed for call to prevent reentry attacks; If .value fails to send, it will return false; passing all available gas calls (which can be restricted by passing in the gas_value parameter) cannot effectively prevent reentry attacks.

If the return value of the send and call.value switch functions is not been checked in the code, the contract will continue to execute the following code,and it may have caused unexpected results due to Ether sending failure.

Test results: No related vulnerabilities in smart contract code

Safety advice：None。

3.5. **Bad Randomness【Pass】**

Smart Contract May Need to Use Random Numbers. While Solidity offers functions and variables that can access apparently hard-to-predict values just as block.number and block.timestamp. they are generally either more public than they seem or subject to miners' influence. Because these sources of randomness are to an extent predictable, malicious users can generally replicate it and attack the function relying on its unpredictablility.

Test results: No related vulnerabilities in smart contract code

Safety advice：None。

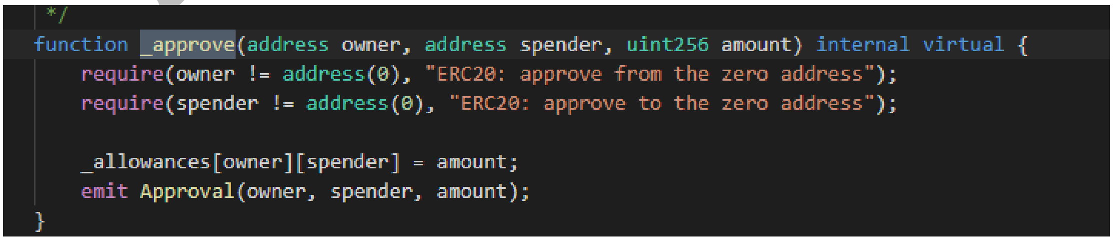
3.6. **Transaction ordering dependence【Low】**

Since miners always get rewarded via gas fees for running code on behalf of externally owned addresses (EOA), users can specify higher fees to have their transactions mined more quickly. Since the Ethereum blockchain is public, everyone can see the contents of others' pending transactions.

This means if a given user is revealing the solution to a puzzle or other valuable secret, a malicious user can steal the solution and copy their transaction with higher fees to preempt the original solution.

Test results: After testing, there are related vulnerabilities in the smart contract code.

contracts\ERC20.sol lines 74



```
 */
function _approve(address owner, address spender, uint256 amount) internal virtual {
    require(owner != address(0), "ERC20: approve from the zero address");
    require(spender != address(0), "ERC20: approve to the zero address");

    _allowances[owner][spender] = amount;
    emit Approval(owner, spender, amount);
}
```

Safety advice：

1. When the approve function changes the quota from N to M, it can only be changed from N to 0, and then from 0 to M: require((_value == 0) || (allowance[msg.sender][_spender] == 0));

2. Use increaseApproval function and decreaseApproval function instead of approve function.

3.7. Denial of service attack detection【Pass】

In the ethernet world, denial of service is deadly, and smart contracts under attack of this type may never be able to return to normal. There may be a number of reasons for a denial of service in smart contracts, including malicious behavior as a recipient of transactions, gas depletion caused by artificially increased computing gas, and abuse of access control to access the private components of the intelligent contract. Take advantage of confusion and neglect, etc.

Test results: No related vulnerabilities in smart contract code.

Safety advice: None.

3.8. Logical design Flaw【Pass】

Detect the security problems related to business design in the contract code.

Test results: No related vulnerabilities in smart contract code.

Safety advice: None.

3.9. USDT Fake Deposit Issue【Pass】

In the transfer function of the token contract, the balance check of the transfer initiator (msg.sender) is judged by if. When balances[msg.sender] < value, it enters the else logic part and returns false, and finally no exception is thrown. We believe that only the modest judgment of if/else is an imprecise coding method in the sensitive function scene such as transfer.

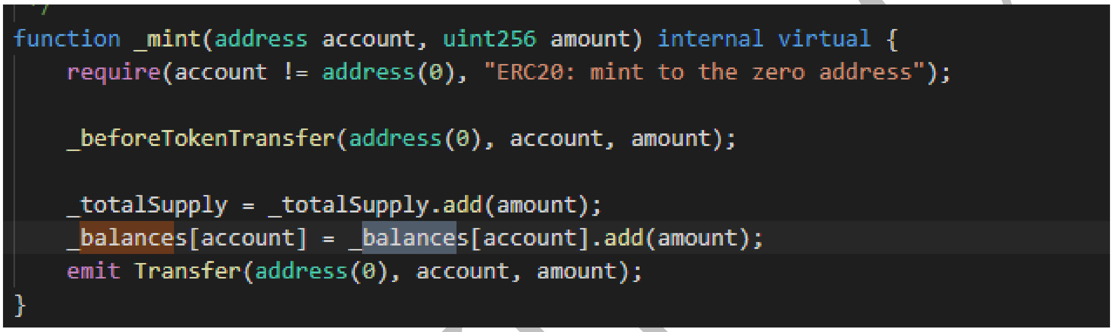
Detection results: No related vulnerabilities in smart contract code..

Safety advice: none

3.10. Adding tokens 【Low】

It is detected whether there is a function in the token contract that may increase the total amount of tokens after the total amount of tokens is initialized.

Detection results: After testing, there are related vulnerabilities in the smart contract code.



```
function _mint(address account, uint256 amount) internal virtual {
    require(account != address(0), "ERC20: mint to the zero address");

    _beforeTokenTransfer(address(0), account, amount);

    _totalSupply = _totalSupply.add(amount);
    _balances[account] = _balances[account].add(amount);
    emit Transfer(address(0), account, amount);
}
```

Safety advice:

This issue is not a security issue, but some exchanges will restrict the use of additional issuance functions, and the specific circumstances need to be determined according to the requirements of the exchange.

3.11. Freezing accounts bypassed【Pass】

In the token contract, when transferring the token, it is detected whether there is an unverified token source account, an originating account, and whether the target account is frozen.

Detection results: No related vulnerabilities in smart contract code.

Safety advice: none.

4. Appendix A：Contract code

```
 • /**
 *Submitted for verification at Etherscan.io on 2020-09-19
*/

// SPDX-License-Identifier: MIT

pragma solidity ^0.6.0;

/*
 * @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 GSN 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 payable) {
        return msg.sender;
    }

    function _msgData() internal view virtual returns (bytes memory) {
        this; // silence state mutability warning without generating bytecode - see
https://github.com/ethereum/solidity/issues/2691
        return msg.data;
    }
}


/**
 * @dev Wrappers over Solidity's arithmetic operations with added overflow
 * checks.
 *
 * Arithmetic operations in Solidity wrap on overflow. This can easily result
 * in bugs, because programmers usually assume that an overflow raises an
 * error, which is the standard behavior in high level programming languages.
 * `SafeMath` restores this intuition by reverting the transaction when an
 * operation overflows.
 *
 * Using this library instead of the unchecked operations eliminates an entire
 * class of bugs, so it's recommended to use it always.
 */
library SafeMath {
    /**
     * @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) {
        uint256 c = a + b;
        require(c >= a, "SafeMath: addition overflow");

        return c;
    }

    /**
     * @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 sub(a, b, "SafeMath: subtraction overflow");
    }

    /**
     * @dev Returns the subtraction of two unsigned integers, reverting with custom
message on
     * overflow (when the result is negative).
     *
     * Counterpart to Solidity's `-` operator.
     *
     * Requirements:
     *
     * - Subtraction cannot overflow.
     */
    function sub(uint256 a, uint256 b, string memory errorMessage) internal pure
returns (uint256) {
        require(b <= a, errorMessage);
        uint256 c = a - b;

        return c;
    }

    /**
     * @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) {
        // 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 0;
        }

        uint256 c = a * b;
        require(c / a == b, "SafeMath: multiplication overflow");

        return c;
    }

    /**
     * @dev Returns the integer division of two unsigned integers. Reverts 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) internal pure returns (uint256) {
        return div(a, b, "SafeMath: division by zero");
    }

    /**
     * @dev Returns the integer division of two unsigned integers. Reverts 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) {
        require(b > 0, errorMessage);
        uint256 c = a / b;
        // assert(a == b * c + a % b); // There is no case in which this doesn't hold

        return c;
    }

    /**
     * @dev Returns the remainder of dividing two unsigned integers. (unsigned integer
modulo),
     * Reverts 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 mod(a, b, "SafeMath: modulo by zero");
    }

    /**
     * @dev Returns the remainder of dividing two unsigned integers. (unsigned integer
modulo),
     * Reverts with custom message 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, string memory errorMessage) internal pure
returns (uint256) {
        require(b != 0, errorMessage);
        return a % b;
    }

     function sqrt(uint x)public pure returns(uint y) {
        uint z = (x + 1) / 2;
        y = x;
        while (z < y) {
            y = z;
            z = (x / z + z) / 2;
        }
    }
}


/**
 * @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
     * ====
     */
    function isContract(address account) internal view returns (bool) {
        // This method relies in extcodesize, which returns 0 for contracts in
        // construction, since the code is only stored at the end of the
        // constructor execution.

        uint256 size;
        // solhint-disable-next-line no-inline-assembly
        assembly { size := extcodesize(account) }
        return size > 0;
    }

    /**
     * @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-interactions-pattern[checks-effects-interactions pattern].
     */
    function sendValue(address payable recipient, uint256 amount) internal {
        require(address(this).balance >= amount, "Address: insufficient balance");

        // solhint-disable-next-line avoid-low-level-calls, avoid-call-value
        (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.decode#abi-encoding-and-decoding-functions[`abi.decode`].
     *
     * 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`.
     * - 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-}[`functionCallWithValue`], but
     * 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");
        return _functionCallWithValue(target, data, value, errorMessage);
    }

    function _functionCallWithValue(address target, bytes memory data, uint256
weiValue, string memory errorMessage) private returns (bytes memory) {
        require(isContract(target), "Address: call to non-contract");

        // solhint-disable-next-line avoid-low-level-calls
        (bool success, bytes memory returndata) = target.call{ value: weiValue }(data);
        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

                // solhint-disable-next-line no-inline-assembly
                assembly {
                    let returndata_size := mload(returndata)
                    revert(add(32, returndata), returndata_size)
                }
            } else {
                revert(errorMessage);
            }
        }
    }
}


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

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


/**
 * @dev Implementation of the {IERC20} interface.
 *
 * This implementation is agnostic to the way tokens are created. This means
 * that a supply mechanism has to be added in a derived contract using {_mint}.
 * For a generic mechanism see {ERC20PresetMinterPauser}.
 *
 * TIP: For a detailed writeup see our guide
 * https://forum.zeppelin.solutions/t/how-to-implement-erc20-supply-mechanisms/226[How
 * to implement supply mechanisms].
 *
 * We have followed general OpenZeppelin guidelines: functions revert instead
 * of returning `false` on failure. This behavior is nonetheless conventional
 * and does not conflict with the expectations of ERC20 applications.
 *
 * Additionally, an {Approval} event is emitted on calls to {transferFrom}.
 * This allows applications to reconstruct the allowance for all accounts just
 * by listening to said events. Other implementations of the EIP may not emit
 * these events, as it isn't required by the specification.
 *
 * Finally, the non-standard {decreaseAllowance} and {increaseAllowance}
 * functions have been added to mitigate the well-known issues around setting
 * allowances. See {IERC20-approve}.
 */
```

```
contract ERC20 is Context, IERC20 {
    using SafeMath for uint256;
    using Address for address;

    mapping (address => uint256) public _balances;

    mapping (address => mapping (address => uint256)) internal _allowances;

    uint256 public _totalSupply;

    string internal _name;
    string internal _symbol;
    uint8 internal _decimals;

    /**
     * @dev Sets the values for {name} and {symbol}, initializes {decimals} with
     * a default value of 18.
     *
     * To select a different value for {decimals}, use {_setupDecimals}.
     *
     * All three of these values are immutable: they can only be set once during
     * construction.
     */
    constructor (string memory name, string memory symbol) public {
        _name = name;
        _symbol = symbol;
        _decimals = 18;
    }

    /**
     * @dev Returns the name of the token.
     */
    function name() public view returns (string memory) {
        return _name;
    }

    /**
     * @dev Returns the symbol of the token, usually a shorter version of the
     * name.
     */
    function symbol() public view returns (string memory) {
        return _symbol;
    }

    /**
     * @dev Returns the number of decimals used to get its user representation.
     * For example, if `decimals` equals `2`, a balance of `505` tokens should
     * be displayed to a user as `5,05` (`505 / 10 ** 2`).
     *
     * Tokens usually opt for a value of 18, imitating the relationship between
     * Ether and Wei. This is the value {ERC20} uses, unless {_setupDecimals} is
     * called.
     *
     * NOTE: This information is only used for _display_ purposes: it in
     * no way affects any of the arithmetic of the contract, including
     * {IERC20-balanceOf} and {IERC20-transfer}.
     */
    function decimals() public view returns (uint8) {
        return _decimals;
    }

    /**
     * @dev See {IERC20-totalSupply}.
     */
    function totalSupply() public view virtual override returns (uint256) {
        return _totalSupply;
    }

    /**
     * @dev See {IERC20-balanceOf}.
     */
    function balanceOf(address account) public view virtual override returns (uint256)
{
        return _balances[account];
    }

    /**
```

```
     * @dev See {IERC20-transfer}.
     *
     * Requirements:
     *
     * - `recipient` cannot be the zero address.
     * - the caller must have a balance of at least `amount`.
     */
    function transfer(address recipient, uint256 amount) public virtual override
returns (bool) {
        _transfer(_msgSender(), recipient, amount);
        return true;
    }

    /**
     * @dev See {IERC20-allowance}.
     */
    function allowance(address owner, address spender) public view virtual override
returns (uint256) {
        return _allowances[owner][spender];
    }

    /**
     * @dev See {IERC20-approve}.
     *
     * Requirements:
     *
     * - `spender` cannot be the zero address.
     */
    function approve(address spender, uint256 amount) public virtual override returns
(bool) {
        _approve(_msgSender(), spender, amount);
        return true;
    }

    /**
     * @dev See {IERC20-transferFrom}.
     *
     * Emits an {Approval} event indicating the updated allowance. This is not
     * required by the EIP. See the note at the beginning of {ERC20};
     *
     * Requirements:
     * - `sender` and `recipient` cannot be the zero address.
     * - `sender` must have a balance of at least `amount`.
     * - the caller must have allowance for ``sender``'s tokens of at least
     * `amount`.
     */
    function transferFrom(address sender, address recipient, uint256 amount) public
virtual override returns (bool) {
        _transfer(sender, recipient, amount);
        _approve(sender, _msgSender(), _allowances[sender][_msgSender()].sub(amount,
"ERC20: transfer amount exceeds allowance"));
        return true;
    }

    /**
     * @dev Atomically increases the allowance granted to `spender` by the caller.
     *
     * This is an alternative to {approve} that can be used as a mitigation for
     * problems described in {IERC20-approve}.
     *
     * Emits an {Approval} event indicating the updated allowance.
     *
     * Requirements:
     *
     * - `spender` cannot be the zero address.
     */
    function increaseAllowance(address spender, uint256 addedValue) public virtual
returns (bool) {
        _approve(_msgSender(), spender,
_allowances[_msgSender()][spender].add(addedValue));
        return true;
    }

    /**
     * @dev Atomically decreases the allowance granted to `spender` by the caller.
     *
     * This is an alternative to {approve} that can be used as a mitigation for
     * problems described in {IERC20-approve}.
     *
     * Emits an {Approval} event indicating the updated allowance.
     *
     * Requirements:
     *
     * - `spender` cannot be the zero address.
     * - `spender` must have allowance for the caller of at least
     * `subtractedValue`.
     */
    function decreaseAllowance(address spender, uint256 subtractedValue) public virtual
returns (bool) {
        _approve(_msgSender(), spender,
_allowances[_msgSender()][spender].sub(subtractedValue, "ERC20: decreased allowance
below zero"));
        return true;
    }

    /**
     * @dev Moves tokens `amount` from `sender` to `recipient`.
     *
     * This is internal function is equivalent to {transfer}, and can be used to
     * e.g. implement automatic token fees, slashing mechanisms, etc.
     *
     * Emits a {Transfer} event.
     *
     * Requirements:
     *
     * - `sender` cannot be the zero address.
     * - `recipient` cannot be the zero address.
     * - `sender` must have a balance of at least `amount`.
     */
    function _transfer(address sender, address recipient, uint256 amount) internal
virtual {
        require(sender != address(0), "ERC20: transfer from the zero address");
        require(recipient != address(0), "ERC20: transfer to the zero address");

        _beforeTokenTransfer(sender, recipient, amount);

        _balances[sender] = _balances[sender].sub(amount, "ERC20: transfer amount
exceeds balance");
        _balances[recipient] = _balances[recipient].add(amount);
        emit Transfer(sender, recipient, amount);
    }

    /** @dev Creates `amount` tokens and assigns them to `account`, increasing
     * the total supply.
     *
     * Emits a {Transfer} event with `from` set to the zero address.
     *
     * Requirements
     *
     * - `to` cannot be the zero address.
     */
    function _mint(address account, uint256 amount) internal virtual {
        require(account != address(0), "ERC20: mint to the zero address");

        _beforeTokenTransfer(address(0), account, amount);

        _totalSupply = _totalSupply.add(amount);
        _balances[account] = _balances[account].add(amount);
        emit Transfer(address(0), account, amount);
    }

    /**
     * @dev Destroys `amount` tokens from `account`, reducing the
     * total supply.
     *
     * Emits a {Transfer} event with `to` set to the zero address.
     *
     * Requirements
     *
     * - `account` cannot be the zero address.
     * - `account` must have at least `amount` tokens.
     */
    function _burn(address account, uint256 amount) internal virtual {
        require(account != address(0), "ERC20: burn from the zero address");
        _beforeTokenTransfer(account, address(0), amount);

        _balances[account] = _balances[account].sub(amount, "ERC20: burn amount exceeds
balance");
        _totalSupply = _totalSupply.sub(amount);
        emit Transfer(account, address(0), amount);
    }

    /**
     * @dev Sets `amount` as the allowance of `spender` over the `owner`s tokens.
     *
     * This is internal function is equivalent to `approve`, and can be used to
     * e.g. set automatic allowances for certain subsystems, etc.
     *
     * Emits an {Approval} event.
     *
     * Requirements:
     *
     * - `owner` cannot be the zero address.
     * - `spender` cannot be the zero address.
     */
    function _approve(address owner, address spender, uint256 amount) internal virtual
{
        require(owner != address(0), "ERC20: approve from the zero address");
        require(spender != address(0), "ERC20: approve to the zero address");

        _allowances[owner][spender] = amount;
        emit Approval(owner, spender, amount);
    }

    /**
     * @dev Sets {decimals} to a value other than the default one of 18.
     *
     * WARNING: This function should only be called from the constructor. Most
     * applications that interact with token contracts will not expect
     * {decimals} to ever change, and may work incorrectly if it does.
     */
    function _setupDecimals(uint8 decimals_) internal {
        _decimals = decimals_;
    }

    /**
     * @dev Hook that is called before any transfer of tokens. This includes
     * minting and burning.
     *
     * Calling conditions:
     *
     * - when `from` and `to` are both non-zero, `amount` of ``from``'s tokens
     * will be to transferred to `to`.
     * - when `from` is zero, `amount` tokens will be minted for `to`.
     * - when `to` is zero, `amount` of ``from``'s tokens will be burned.
     * - `from` and `to` are never both zero.
     *
     * To learn more about hooks, head to xref:ROOT:extending-contracts.adoc#using-
hooks[Using Hooks].
     */
    function _beforeTokenTransfer(address from, address to, uint256 amount) internal
virtual { }

}


contract SfgToken is ERC20 {

     constructor(address SfgFarm) ERC20("Stable Finance Governance Token", "SFG")
public {
         uint8 decimals = 18;
         _setupDecimals(decimals);

         _mint(SfgFarm,  21000000 * 10 ** uint256(decimals));      // 100%, 21000000
     }
}

contract SfyToken is ERC20 {

     constructor(address SfyFarm) ERC20("Stable Finance Yield Token", "SFY") public {
         uint8 decimals = 18;
         _setupDecimals(decimals);

         _mint(SfyFarm,  21000000 * 10 ** uint256(decimals));      // 100%, 21000000
     }
}
```

5. Appendix B: vulnerability risk rating criteria

Smart contract vulnerability rating standard	
Vulnerability rating	Vulnerability rating description
High risk vulnerability	The loophole which can directly cause the contract or the user's fund loss, such as the value overflow loophole which can cause the value of the substitute currency to zero, the false recharge loophole that can cause the exchange to lose the substitute coin, can cause the contract account to lose the ETH or the reentry loophole of the substitute currency, and so on; It can cause the loss of ownership rights of token contract, such as: the key function access control defect or call injection leads to the key function access control bypassing, and the loophole that the token contract can not work properly. Such as: a denial-of-service vulnerability due to sending ETHs to a malicious address, and a denial-of-service vulnerability due to gas depletion.
Middle risk vulnerability	High risk vulnerabilities that need specific addresses to trigger, such as numerical overflow vulnerabilities that can be triggered by the owner of a token contract, access control defects of non-critical functions, and logical design defects that do not result in direct capital losses, etc.
Low risk vulnerability	A vulnerability that is difficult to trigger, or that will harm a limited number after triggering, such as a numerical overflow that requires a large number of ETH or tokens to trigger, and a vulnerability that the attacker cannot directly profit from after triggering a numerical overflow. Rely on risks by specifying the order of transactions triggered by a high gas.

6. Appendix C：Introduction of test tool

6.1. Manticore

Manticore is a symbolic execution tool for analysis of binaries and smart contracts. It discovers inputs that crash programs via memory safety violations. Manticore records an instruction-level trace of execution for each generated input and exposes programmatic access to its analysis engine via a Python API.

6.2. Oyente

Oyente is a smart contract analysis tool that Oyente can use to detect common bugs in smart contracts, such as reentrancy, transaction ordering dependencies, and more. More conveniently, Oyente's design is modular, so this allows advanced users to implement and insert their own detection logic to check for custom attributes in their contracts.

6.3. securify.sh

Securify can verify common security issues with Ethereum smart contracts, such as transactional out-of-order and lack of input validation. It analyzes all possible execution paths of the program while fully automated. In addition, Securify has a specific language for specifying vulnerabilities. Securify can keep an eye on current security and other reliability issues.

6.4. Echidna

Echidna is a Haskell library designed for fuzzing EVM code.

6.5. MAIAN

MAIAN is an automated tool for finding Ethereum smart contract vulnerabilities. Maian deals with the contract's bytecode and tries to establish a series of transactions to find and confirm errors.

6.6. ethersplay

Ethersplay is an EVM disassembler that contains related analysis tools.

6.7. ida-evm

Ida-evm is an IDA processor module for the Ethereum Virtual Machine (EVM).

6.8. Remix-ide

Remix is a browser-based compiler and IDE that allows users to build Ethereum contracts and debug transactions using the Solidity language.

6.9. Knownsec Penetration Tester Special Toolkit

Knownsec penetration tester special tool kit, developed and collected by Knownsec penetration testing engineers, includes batch automatic testing tools dedicated to testers, self-developed tools, scripts, or utility tools.