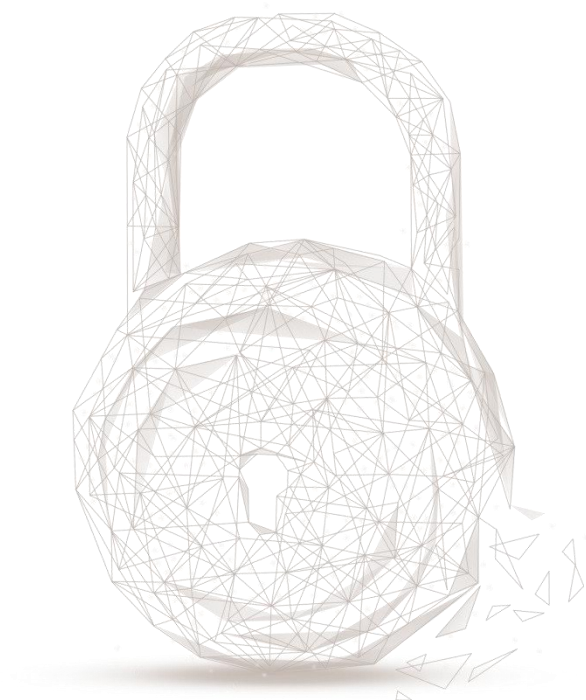




# 智能合约安全审计报告



审计编号：202101221732

审计合约名称：

Filecoin Community Governance Token (FCT)

审计合约地址：

THRqTz6r1tZC1M1nQioimkJ8EQo1UgRJfs

审计合约链接地址：

<https://tronscan.org/#/contract/THRqTz6r1tZC1M1nQioimkJ8EQo1UgRJfs/code>

合约审计开始日期：2021. 01. 22

合约审计完成日期：2021. 01. 22

审计结果：通过（优）

审计团队：成都链安科技有限公司

#### 审计类型及结果：

序号	审计类型	审计子项	审计结果
1	代码规范审计	TRC-20 Token 标准规范审计	通过
		编译器版本安全审计	通过
		可见性规范审计	通过
		gas 消耗审计	通过
		SafeMath 功能审计	通过
		fallback 函数使用审计	通过
		tx.origin 使用审计	通过
		弃用项审计	通过
		冗余代码审计	通过
		变量覆盖审计	通过
2	函数调用审计	函数调用权限审计	通过
		call/delegatecall 安全审计	通过
		返回值安全审计	通过
		自毁函数安全审计	通过
3	业务安全审计	owner 权限审计	通过
		业务逻辑审计	通过
		业务实现审计	通过
4	整型溢出审计	-	通过
5	可重入攻击审计	-	通过
6	异常可达状态审计	-	通过
7	交易顺序依赖审计	-	通过
8	块参数依赖审计	-	通过
9	伪随机数生成审计	-	通过

10	拒绝服务攻击审计	-	通过
11	代币锁仓审计	-	无锁仓
12	假充值审计	-	通过
13	event 安全审计	-	通过

备注：审计意见及建议请见代码注释。

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## 审计结果说明：

本公司采用形式化验证、静态分析、动态分析、典型案例测试和人工审核的方式对智能合约FCT的代码规范性、安全性以及业务逻辑三个方面进行多维度全面的安全审计。**经审计，FCT合约通过所有检测项，合约审计结果为通过(优)，合约可正常使用。**以下为本合约基本信息。

### 1、代币基本信息

Token name	Filecoin Community Governance Token
Token symbol	FCT
decimals	6
totalSupply	9999 (总量恒定)
Token type	TRC20

表1 代币基本信息

### 2、代币锁仓信息

无锁仓

## 合约源代码审计注释：

```
pragma solidity ^0.5.0; // 成都链安 // 建议固定编译器版本
/**
 * @dev Interface of the ERC20 standard as defined in the EIP. Does not include
 * the optional functions; to access them see {ERC20Detailed}.
 */
// 成都链安 // 定义 TRC-20 Token 标准要求的接口函数
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); // 成都链安 //
声明代币转账事件
/**
 * @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); // 成都链
安 // 声明代币授权事件
}
/**
 * @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.
 */
// 成都链安 // 防溢出的安全数学运算库
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) {
    require(b <= a, "SafeMath: subtraction overflow");
    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) {
    // Solidity only automatically asserts when dividing by 0
    require(b > 0, "SafeMath: division by zero");
    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) {
    require(b != 0, "SafeMath: modulo by zero");
    return a % b;
}
}
/**
 * @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 {ERC20Mintable}.
 *
 * 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 Ownable {
    address owner; // 成都链安 // 声明变量 owner，用于存储合约所有者地址
    address newOwner; // 成都链安 // 声明变量 newOwner，用于存储合约新的所有者地址
    constructor() internal {
        owner = msg.sender; // 成都链安 // 构造函数，设置合约创建者为 owner
    }
    // 成都链安 // 修饰器，检查调用者为 owner
    modifier onlyOwner() {
        require(msg.sender == owner);
        _;
    }
    // 成都链安 // 修改 newOwner 地址，仅 owner 可以调用
    function ChangeOwnership(address p_newOwner) external onlyOwner {
        newOwner = p_newOwner;
    }
    // 成都链安 // newOwner 接收 owner 权限，仅 newOwner 可以调用
    function AcceptOwnership() external {
        require(msg.sender == newOwner);
        owner = newOwner;
    }
    // 成都链安 // 返回当前 owner 地址
    function owner() public view returns (address) {
        return owner;
    }
}

contract ERC20 is IERC20, Ownable {
    using SafeMath for uint256; // 成都链安 // 引入 SafeMath 安全数学运算库，避免数学运算整型溢出
    mapping(address => uint256) private _balances; // 成都链安 // 声明 mapping 变量 _balances，存储指定地址的代币余额
    mapping(address => mapping(address => uint256)) private _allowances; // 成都链安 // 声明 mapping 变量 _allowances，存储对应地址间的授权值
    uint256 private _totalSupply; // 成都链安 // 声明变量 _totalSupply，存储代币总量
    /**
     * @dev See {IERC20-totalSupply}.
     */
    function totalSupply() public view returns (uint256) {
        return _totalSupply;
    }
    /**
     * @dev See {IERC20-balanceOf}.
     */
    function balanceOf(address account) public view 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 returns (bool) {
        require(amount >= 0, "Cannot transfer lower 0"); // 成都链安 // 检查转账金额大于等于
0
        _transfer(msg.sender, recipient, amount); // 成都链安 // 调用内部函数_transfer 进行代
币转账
        return true;
    }
    /**
     * @dev See {IERC20-allowance}.
     */
    function allowance(address owner, address spender)
        public
        view
        returns (uint256)
    {
        return _allowances[owner][spender];
    }
    /**
     * @dev See {IERC20-approve}.
     *
     * Requirements:
     *
     * - `spender` cannot be the zero address.
     */
    // 成都链安 // 用户调用该函数修改授权值时，可能导致多重授权
    // 成都链安 // 建议用户使用 increaseAllowance 与 decreaseAllowance 修改授权值
    function approve(address spender, uint256 value) public returns (bool) {
        _approve(msg.sender, spender, value); // 成都链安 // 调用内部函数_approve 设置调用者
对 spender 的授权值
        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 `value`.
* - the caller must have allowance for `sender`'s tokens of at least
* `amount`.
*/
function transferFrom(
    address sender,
    address recipient,
    uint256 amount
) public returns (bool) {
    _transfer(sender, recipient, amount); // 成都链安 // 调用内部函数_transfer 进行代币转账
    _approve(
        sender,
        msg.sender,
        _allowances[sender][msg.sender].sub(amount)
    ); // 成都链安 // 调用内部函数_approve 更新转账源地址 sender 对调用者的授权值
    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
    returns (bool)
{
    _approve(
        msg.sender,
        spender,
        _allowances[msg.sender][spender].add(addedValue)
    ); // 成都链安 // 调用内部函数_approve 增加调用者对 spender 的授权值，增加值为
    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
    returns (bool)
{
    _approve(
        msg.sender,
        spender,
        _allowances[msg.sender][spender].sub(subtractedValue)
    ); // 成都链安 // 调用内部函数_approve 减少调用者对 spender 的授权值，减少值为
subtractedValue
    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 {
    require(sender != address(0), "ERC20: transfer from the zero address"); // 成都链安
// sender 非零地址检查
    require(recipient != address(0), "ERC20: transfer to the zero address"); // 成都链安
// recipient 非零地址检查，避免转账代币丢失
    // 成都链安 // 修改转账双方地址的代币余额
    _balances[sender] = _balances[sender].sub(amount);
    _balances[recipient] = _balances[recipient].add(amount);
}
```

```
    emit Transfer(sender, recipient, amount); // 成都链安 // 触发 Transfer 事件
}

/** @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 {
    require(account != address(0), "ERC20: mint to the zero address"); // 成都链安 //
account 非零地址检查
    _totalSupply = _totalSupply.add(amount); // 成都链安 // 更新代币总量
    _balances[account] = _balances[account].add(amount); // 成都链安 // 修改 account 地址
的代币余额
    emit Transfer(address(0), account, amount); // 成都链安 // 触发 Transfer 事件
}

/**
 * @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.
 */
// 成都链安 // 冗余代码，建议删除
function _burn(address account, uint256 value) internal {
    require(account != address(0), "ERC20: burn from the zero address");
    _totalSupply = _totalSupply.sub(value);
    _balances[account] = _balances[account].sub(value);
    emit Transfer(account, address(0), value);
}

/**
 * @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 value
) internal {
    require(owner != address(0), "ERC20: approve from the zero address"); // 成都链安 //
owner 非零地址检查
    require(spender != address(0), "ERC20: approve to the zero address"); // 成都链安 //
spender 非零地址检查
    _allowances[owner][spender] = value; // 成都链安 // 设置 owner 对 spender 的授权值为
value
    emit Approval(owner, spender, value); // 成都链安 // 触发 Approval 事件
}
/**
 * @dev Destroys `amount` tokens from `account`. `amount` is then deducted
 * from the caller's allowance.
 *
 * See {_burn} and {_approve}.
 */
// 成都链安 // 冗余代码，建议删除
function _burnFrom(address account, uint256 amount) internal {
    _burn(account, amount);
    _approve(
        account,
        msg.sender,
        _allowances[account][msg.sender].sub(amount)
    );
}
}
/**
 * @dev Optional functions from the ERC20 standard.
 */
contract ERC20Detailed is IERC20 {
    string private _name; // 成都链安 // 声明变量_name, 存储代币名称
    string private _symbol; // 成都链安 // 声明变量_symbol, 存储代币简称
    uint8 private _decimals; // 成都链安 // 声明变量_decimals, 存储代币精度
    /**
     * @dev Sets the values for `name`, `symbol`, and `decimals`. All three of
     * these values are immutable: they can only be set once during
     * construction.
     */
    constructor (string memory name, string memory symbol, uint8 decimals) public {
        _name = name;
        _symbol = symbol;
        _decimals = decimals;
    }
}
```



```
/**
 * @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.
 *
 * 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;
}
}

// 0.5.1-c8a2
// Enable optimization
/**
 * @title SimpleToken
 * @dev Very simple ERC20 Token example, where all tokens are pre-assigned to the creator.
 * Note they can later distribute these tokens as they wish using `transfer` and other
 * `ERC20` functions.
 */
contract FCT is ERC20, ERC20Detailed {
    /**
     * @dev Constructor that gives msg.sender all of existing tokens.
     */
    // 成都链安 // 构造函数，初始化代币基本信息
    constructor() public ERC20Detailed("Filecoin Community Governance Token", "FCT", 6) {
        _mint(msg.sender, 9999 * (10**uint256(decimals()))); // 成都链安 // 将全部初始代币发
        送给合约部署者地址
    }
}

// 成都链安 // 建议主合约继承 Pausable 模块，当出现重大异常时 owner 可以暂停所有交易
```





成都链安  
BEOSIN

官方网址

<https://lianantech.com>

电子邮箱

[vaas@lianantech.com](mailto:vaas@lianantech.com)

微信公众号

