

# CERTiK VERIFICATION REPORT FOR SODA



Request Date: 2018-01-27  
Revision Date: 2019-01-31

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# PASS

CERTIK believes this  
smart contract passes security  
qualifications to be listed on  
digital asset exchanges.

Jan 31, 2019



## Summary

This is the report for smart contract verification service requested by Soda. The goal of the audition is to guarantee that verified smart contracts are robust enough to avoid potentially unexpected loopholes.

The result of this report is only a reflection of the source code that was determined in this scope, and of the source code at the audit time.

## Type of Issues

CertiK smart label engine applied 100% covered formal verification labels on the source code, and scanned the code by static analysis and formal verification engine to detect the follow type of issues.

Title	Description	Issues	SWC ID
Integer Overflow and Underflow	An overflow/underflow happens when an arithmetic operation reaches the maximum or minimum size of a type.	0	SWC-101
Function incorrectness	Function implementation does not meet the specification, leading to intentional or unintentional vulnerabilities.	0	
Buffer Overflow	An attacker is able to write to arbitrary storage locations of a contract if array of out bound happens	0	SWC-124
Reentrancy	A malicious contract can call back into the calling contract before the first invocation of the function is finished.	0	SWC-107
Transaction Order Dependence	A race condition vulnerability occurs when code depends on the order of the transactions submitted to it.	0	SWC-114
Timestamp Dependence	Timestamp can be influenced by minors to some degree.	0	SWC-116

Insecure Compiler Version	Com-	Using an fixed outdated compiler version or floating pragma can be problematic, if there are publicly disclosed bugs and issues that affect the current compiler version used.	0	SWC-102 SWC-103
Insecure Randomness	Ran-	Block attributes are insecure to generate random numbers, as they can be influenced by minors to some degree.	0	SWC-120
“tx.origin” for authorization	for	tx.origin should not be used for authorization. Use msg.sender instead.	0	SWC-115
Delegatecall to Untrusted Callee	to	Calling into untrusted contracts is very dangerous, the target and arguments provided must be sanitized.	0	SWC-112
State Variable Default Visibility	Variable	Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.	0	SWC-108
Function Default Visibility	Default	Functions are public by default. A malicious user is able to make unauthorized or unintended state changes if a developer forgot to set the visibility.	0	SWC-100
Uninitialized variables		Uninitialized local storage variables can point to other unexpected storage variables in the contract.	0	SWC-109
Assertion Failure		The assert() function is meant to assert invariants. Properly functioning code should never reach a failing assert statement.	0	SWC-110
Deprecated Solidity Features		Several functions and operators in Solidity are deprecated and should not be used as best practice.	0	SWC-111
Unused variables		Unused variables reduce code quality	0	

## Vulnerability Details

### Critical

No issue found.

### Medium

No issue found.

### Low

#### Owner can issue more coins after contract construction.

This is not a vulnerability. But one thing that some exchanges are concerned about. Generally if contract owner can issue more tokens, it can reduce the value of the token owner.

#### TransferFrom reduces sender’s allowance even when sender = receiver

When from is the same as to, transferFrom reduces the sender allowance, even though there is no change in the transaction.



For every issues found, CertiK categorizes them into 3 buckets based on its risk level:

- Critical: The code implementation does not match the specification, or it could result in loss of funds for contract owner or users.
- Medium: The code implementation does not match the specification at certain condition, or it could affect the security standard by lost of access control.
- Low: The code implementation is not a best practice, or use a suboptimal design pattern, which may lead to security vulnerability, but no concern found yet.

## Source Code with CertiK Labels

File sodacoin.sol

```

1  pragma solidity ^0.4.24;
2
3
4  contract SafeMath {
5      /*@CTK "SafeMath add"
6          @post (a + b < a || a + b < b) == __reverted
7          @post !__reverted -> c == a + b
8          @post !__reverted -> !__has_overflow
9      */
10     function safeAdd(uint a, uint b) public pure returns (uint c) {
11         c = a + b;
12         require(c >= a);
13     }
14     /*@CTK "SafeMath sub"
15         @post (a < b) == __reverted
16         @post !__reverted -> c == a - b
17         @post !__reverted -> !__has_overflow
18     */
19     function safeSub(uint a, uint b) public pure returns (uint c) {
20         require(b <= a);
21         c = a - b;
22     }
23     /*@CTK "SafeMath mul"
24         @post (a > 0) && ((a * b) / a != b) -> __reverted
25         @post __reverted -> (a > 0) && ((a * b) / a != b)
26         @post !__reverted -> c == a * b
27         @post !__reverted == !__has_overflow
28     */
29     function safeMul(uint a, uint b) public pure returns (uint c) {
30         c = a * b;
31         require(a == 0 || c / a == b);
32     }
33     /*@CTK "SafeMath div"
34         @post b != 0 -> !__reverted
35         @post !__reverted -> c == a / b
36         @post !__reverted -> !__has_overflow
37     */
38     function safeDiv(uint a, uint b) public pure returns (uint c) {
39         require(b > 0);
40         c = a / b;
41     }
42 }
43
44
45 // -----
46 // ERC Token Standard #20 Interface
47 // -----
48 contract ERC20Interface {
49     function totalSupply() public constant returns (uint);
50     function balanceOf(address tokenOwner) public constant returns (uint balance);
51     function allowance(address tokenOwner, address spender) public constant returns (
52         uint remaining);
53     function transfer(address to, uint tokens) public returns (bool success);
54     function approve(address spender, uint tokens) public returns (bool success);

```

```

54     function checkRate() public constant returns (uint rate_);
55
56     event Transfer(address indexed from, address indexed to, uint tokens);
57     event Approval(address indexed tokenOwner, address indexed spender, uint tokens);
58     event Blacklisted(address indexed target);
59     event DeleteFromBlacklist(address indexed target);
60     event RejectedPaymentToBlacklistedAddr(address indexed from, address indexed to,
        uint value);
61     event RejectedPaymentFromBlacklistedAddr(address indexed from, address indexed to,
        uint value);
62     event RejectedPaymentFromLockedAddr(address indexed from, address indexed to, uint
        value, uint lackdatetime, uint now_);
63     event RejectedPaymentMaximunFromLockedAddr(address indexed from, address indexed to,
        uint value);
64     event test1(uint rate, uint a, uint now );
65 }
66
67
68 // -----
69 // Contract function to receive approval and execute function in one call
70 // -----
71 contract ApproveAndCallFallBack {
72     function receiveApproval(address from, uint256 tokens, address token, bytes data)
        public;
73 }
74
75
76 // -----
77 // Owned contract
78 // -----
79 contract Owned {
80     address public owner;
81     address public newOwner;
82
83     event OwnershipTransferred(address indexed _from, address indexed _to);
84
85     /*@CTK Ownable
86     @post __post.owner == msg.sender
87     */
88     constructor() public {
89         owner = msg.sender;
90     }
91
92     modifier onlyOwner {
93         require(msg.sender == owner);
94         _;
95     }
96
97     /*@CTK transferOwnership
98     @tag assume_completion
99     @post owner == msg.sender
100     @post __post.newOwner == _newOwner
101     */
102     function transferOwnership(address _newOwner) public onlyOwner {
103         newOwner = _newOwner;
104     }
105     /*@CTK acceptOwnership
106     @tag assume_completion

```

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```

163     start = now;
164     unlockdate.push(UnlockDateModel({datetime : 1610237400,rate : 10}));
165     unlockdate.push(UnlockDateModel({datetime : 1612915800,rate : 10}));
166     unlockdate.push(UnlockDateModel({datetime : 1615335000,rate : 10}));
167     unlockdate.push(UnlockDateModel({datetime : 1618013400,rate : 10}));
168     unlockdate.push(UnlockDateModel({datetime : 1620605400,rate : 10}));
169     unlockdate.push(UnlockDateModel({datetime : 1623283800,rate : 10}));
170     unlockdate.push(UnlockDateModel({datetime : 1625875800,rate : 10}));
171     unlockdate.push(UnlockDateModel({datetime : 1628554200,rate : 10}));
172     unlockdate.push(UnlockDateModel({datetime : 1631232600,rate : 10}));
173     unlockdate.push(UnlockDateModel({datetime : 1633824600,rate : 10}));
174 }
175 /*@CTK now_
176   @post __return == now
177 */
178 function now_() public constant returns (uint){
179     return now;
180 }
181
182 // -----
183 // Total supply
184 // -----
185 /*@CTK totalSupply
186   @post __return == _totalSupply - balances[address(0)]
187 */
188 function totalSupply() public constant returns (uint) {
189     return _totalSupply - balances[address(0)];
190 }
191
192 // -----
193 // Get the token balance for account tokenOwner
194 // -----
195 /*@CTK balanceOf
196   @post balance == balances[tokenOwner]
197 */
198 function balanceOf(address tokenOwner) public constant returns (uint balance) {
199     return balances[tokenOwner];
200 }
201
202 function checkRate() public constant returns (uint rate_){
203     uint rate = 0;
204     for (uint i = 0; i<unlockdate.length; i++) {
205         if (unlockdate[i].datetime < now) {
206             rate = rate + unlockdate[i].rate;
207         }
208     }
209     return rate;
210 }
211
212 // -----
213 // Transfer the balance from token owner's account to to account
214 // - Owner's account must have sufficient balance to transfer
215 // - 0 value transfers are allowed
216 // -----
217
218 function transfer(address to, uint tokens) public returns (bool success) {
219     if (msg.sender == founderAddr || msg.sender == advisorAddr){
220         if (unlockdate[0].datetime > now) {

```



```

221         emit RejectedPaymentFromLockedAddr(msg.sender, to, tokens, unlockdate
222             [0].datetime, now);
223     } else {
224         uint rate = checkRate();
225
226         uint maximum = 3000000000000000000000000 -
227             (3000000000000000000000000 * 0.01) * rate;
228         if (maximum > (balances[msg.sender] - tokens)){
229             emit RejectedPaymentMaximunFromLockedAddr(msg.sender, to, tokens);
230             return false;
231         }
232     }
233
234     if (blacklist[msg.sender] > 0) { // Accounts in the blacklist can not be
235         withdrawn
236         emit RejectedPaymentFromBlacklistedAddr(msg.sender, to, tokens);
237         return false;
238     } else if (blacklist[to] > 0) { // Accounts in the blacklist can not be withdrawn
239         emit RejectedPaymentToBlacklistedAddr(msg.sender, to, tokens);
240         return false;
241     } else {
242         balances[msg.sender] = safeSub(balances[msg.sender], tokens);
243         balances[to] = safeAdd(balances[to], tokens);
244         emit Transfer(msg.sender, to, tokens);
245         return true;
246     }
247 }
248
249 // -----
250 // Token owner can approve for spender to transferFrom(...) tokens
251 // from the token owner's account
252 // -----
253 /*@CTK approve
254   @post __post.allowed[msg.sender][spender] == tokens
255 */
256 function approve(address spender, uint tokens) public returns (bool success) {
257     allowed[msg.sender][spender] = tokens;
258     emit Approval(msg.sender, spender, tokens);
259     return true;
260 }
261
262 // -----
263 // Returns the amount of tokens approved by the owner that can be
264 // transferred to the spender's account
265 // -----
266 /*@CTK allowance
267   @post remaining == allowed[tokenOwner][spender]
268 */
269 function allowance(address tokenOwner, address spender) public constant returns (
270     uint remaining) {
271     return allowed[tokenOwner][spender];
272 }

```

```

275
276 // -----
277 // Token owner can approve for spender to transferFrom(...) tokens
278 // from the token owner's account. The spender contract function
279 // receiveApproval(...) is then executed
280 // -----
281 function approveAndCall(address spender, uint tokens, bytes data) public returns (
    bool success) {
282     allowed[msg.sender][spender] = tokens;
283     emit Approval(msg.sender, spender, tokens);
284     ApproveAndCallFallBack(spender).receiveApproval(msg.sender, tokens, this, data)
    ;
285     return true;
286 }
287
288
289 // -----
290 // Don't accept ETH
291 // -----
292 function () public payable {
293     revert();
294 }
295
296 // -----
297 // Owner can transfer out any accidentally sent ERC20 tokens
298 // -----
299 function transferAnyERC20Token(address tokenAddress, uint tokens) public onlyOwner
    returns (bool success) {
300     return ERC20Interface(tokenAddress).transfer(owner, tokens);
301 }
302
303 // -----
304 // Owner can add an increase total supply.
305 // -----
306 /*@CTK totalSupplyIncrease
307     @tag assume_completion
308     @post __post._totalSupply == _totalSupply + _supply
309     @post __post.balances[msg.sender] == balances[msg.sender] + _supply
310 */
311 function totalSupplyIncrease(uint256 _supply) public onlyOwner{
312     _totalSupply = _totalSupply + _supply;
313     balances[msg.sender] = balances[msg.sender] + _supply;
314 }
315
316 // -----
317 // Owner can add blacklist the wallet address.
318 // -----
319 /*@CTK blacklisting
320     @tag assume_completion
321     @post owner == msg.sender
322     @post __post.blacklist[_addr] == 1
323 */
324 function blacklisting(address _addr) public onlyOwner{
325     blacklist[_addr] = 1;
326     emit Blacklisted(_addr);
327 }
328
329

```

```

330 // -----
331 // Owner can delete from blacklist the wallet address.
332 // -----
333 /*@CTK deleteFromBlacklist
334   @tag assume_completion
335   @post owner == msg.sender
336   @post __post.blacklist[_addr] == -1
337 */
338 function deleteFromBlacklist(address _addr) public onlyOwner{
339   blacklist[_addr] = -1;
340   emit DeleteFromBlacklist(_addr);
341 }
342
343 }

```

File sodatoken.sol

```

1  pragma solidity ^0.4.24;
2
3
4  contract SafeMath {
5      /*@CTK "SafeMath add"
6        @post (a + b < a || a + b < b) == __reverted
7        @post !__reverted -> c == a + b
8        @post !__reverted -> !__has_overflow
9      */
10     function safeAdd(uint a, uint b) public pure returns (uint c) {
11         c = a + b;
12         require(c >= a);
13     }
14     /*@CTK "SafeMath sub"
15       @post (a < b) == __reverted
16       @post !__reverted -> c == a - b
17       @post !__reverted -> !__has_overflow
18     */
19     function safeSub(uint a, uint b) public pure returns (uint c) {
20         require(b <= a);
21         c = a - b;
22     }
23     /*@CTK "SafeMath mul"
24       @post (a > 0) && (((a * b) / a) != b) -> __reverted
25       @post __reverted -> (a > 0) && (((a * b) / a) != b)
26       @post !__reverted -> c == a * b
27       @post !__reverted == !__has_overflow
28     */
29     function safeMul(uint a, uint b) public pure returns (uint c) {
30         c = a * b;
31         require(a == 0 || c / a == b);
32     }
33     /*@CTK "SafeMath div"
34       @post b != 0 -> !__reverted
35       @post !__reverted -> c == a / b
36       @post !__reverted -> !__has_overflow
37     */
38     function safeDiv(uint a, uint b) public pure returns (uint c) {
39         require(b > 0);
40         c = a / b;
41     }
42 }

```

```

43
44
45 // -----
46 // ERC Token Standard #20 Interface
47 // -----
48 contract ERC20Interface {
49     function totalSupply() public constant returns (uint);
50     function balanceOf(address tokenOwner) public constant returns (uint balance);
51     function allowance(address tokenOwner, address spender) public constant returns (
52         uint remaining);
53     function transfer(address to, uint tokens) public returns (bool success);
54     function approve(address spender, uint tokens) public returns (bool success);
55     function transferFrom(address from, address to, uint tokens) public returns (bool
56         success);
57
58     event Transfer(address indexed from, address indexed to, uint tokens);
59     event Approval(address indexed tokenOwner, address indexed spender, uint tokens);
60 }
61
62 // -----
63 // Contract function to receive approval and execute function in one call
64 // -----
65 contract ApproveAndCallFallBack {
66     function receiveApproval(address from, uint256 tokens, address token, bytes data)
67         public;
68 }
69
70 // -----
71 // Owned contract
72 // -----
73 contract Owned {
74     address public owner;
75     address public newOwner;
76
77     event OwnershipTransferred(address indexed _from, address indexed _to);
78
79     /*@CTK Ownable
80     @post __post.owner == msg.sender
81     */
82     constructor() public {
83         owner = msg.sender;
84     }
85
86     modifier onlyOwner {
87         require(msg.sender == owner);
88         _;
89     }
90
91     /*@CTK transferOwnership
92     @tag assume_completion
93     @post owner == msg.sender
94     @post __post.newOwner == _newOwner
95     */
96     function transferOwnership(address _newOwner) public onlyOwner {
97         newOwner = _newOwner;
98     }
99 }

```

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```

155     @post balance == balances[tokenOwner]
156     */
157     function balanceOf(address tokenOwner) public constant returns (uint balance) {
158         return balances[tokenOwner];
159     }
160
161
162     // -----
163     // Transfer the balance from token owner's account to to account
164     // - Owner's account must have sufficient balance to transfer
165     // - 0 value transfers are allowed
166     // -----
167     /*@CTK transfer
168         @tag assume_completion
169         @pre to != msg.sender
170         @post __post.balances[msg.sender] == balances[msg.sender] - tokens
171         @post __post.balances[to] == balances[to] + tokens
172     */
173     function transfer(address to, uint tokens) public returns (bool success) {
174         balances[msg.sender] = safeSub(balances[msg.sender], tokens);
175         balances[to] = safeAdd(balances[to], tokens);
176         emit Transfer(msg.sender, to, tokens);
177         return true;
178     }
179
180
181     // -----
182     // Token owner can approve for spender to transferFrom(...) tokens
183     // from the token owner's account
184     // -----
185     /*@CTK approve
186         @post __post.allowed[msg.sender][spender] == tokens
187     */
188     function approve(address spender, uint tokens) public returns (bool success) {
189         allowed[msg.sender][spender] = tokens;
190         emit Approval(msg.sender, spender, tokens);
191         return true;
192     }
193
194
195     // -----
196     // Transfer tokens from the from account to the to account
197     //
198     // The calling account must already have sufficient tokens approve(...)-d
199     // for spending from the from account and
200     // - From account must have sufficient balance to transfer
201     // - Spender must have sufficient allowance to transfer
202     // - 0 value transfers are allowed
203     // -----
204     /*@CTK transferFrom
205         @tag assume_completion
206         @pre to != from
207         @post __post.balances[from] == balances[from] - tokens
208         @post __post.allowed[from][msg.sender] == allowed[from][msg.sender] - tokens
209         @post __post.balances[to] == balances[to] + tokens
210     */
211     function transferFrom(address from, address to, uint tokens) public returns (bool
        success) {

```

```

212     balances[from] = safeSub(balances[from], tokens);
213     allowed[from][msg.sender] = safeSub(allowed[from][msg.sender], tokens);
214     balances[to] = safeAdd(balances[to], tokens);
215     emit Transfer(from, to, tokens);
216     return true;
217 }
218
219
220 // -----
221 // Returns the amount of tokens approved by the owner that can be
222 // transferred to the spender's account
223 // -----
224 /*@CTK allowance
225   @post remaining == allowed[tokenOwner][spender]
226 */
227 function allowance(address tokenOwner, address spender) public constant returns (
228     uint remaining) {
229     return allowed[tokenOwner][spender];
230 }
231
232 // -----
233 // Token owner can approve for spender to transferFrom(...) tokens
234 // from the token owner's account. The spender contract function
235 // receiveApproval(...) is then executed
236 // -----
237 function approveAndCall(address spender, uint tokens, bytes data) public returns (
238     bool success) {
239     allowed[msg.sender][spender] = tokens;
240     emit Approval(msg.sender, spender, tokens);
241     ApproveAndCallFallBack(spender).receiveApproval(msg.sender, tokens, this, data)
242     ;
243     return true;
244 }
245
246 // -----
247 // Don't accept ETH
248 // -----
249 function () public payable {
250     revert();
251 }
252
253 // -----
254 // Owner can transfer out any accidentally sent ERC20 tokens
255 // -----
256 function transferAnyERC20Token(address tokenAddress, uint tokens) public onlyOwner
257     returns (bool success) {
258     return ERC20Interface(tokenAddress).transfer(owner, tokens);
259 }
260 // Increase issuance.
261 /*@CTK totalSupplyIncrease
262   @tag assume_completion
263   @post __post._totalSupply == _totalSupply + _supply
264   @post __post.balances[msg.sender] == balances[msg.sender] + _supply
265 */
266 function totalSupplyIncrease(uint256 _supply) public onlyOwner{

```





```
266     _totalSupply = _totalSupply + _supply;  
267     balances[msg.sender] = balances[msg.sender] + _supply;  
268 }  
269 }
```

## How to read

### Detail for Request 1

transferFrom to same address


Verification date	 20, Oct 2018
Verification timespan	 395.38 ms

CERTIK label location	Line 30-34 in File howtoread.sol
-----------------------	----------------------------------

CERTIK label	30	/*@CTK FAIL "transferFrom to same address"
	31	@tag assume_completion
	32	@pre from == to
	33	@post __post.allowed[from][msg.sender] ==
	34	*/

Raw code location	Line 35-41 in File howtoread.sol
-------------------	----------------------------------

Raw code	35	function transferFrom(address from, address to
		) {
	36	balances[from] = balances[from].sub(tokens
	37	allowed[from][msg.sender] = allowed[from][
	38	balances[to] = balances[to].add(tokens);
	39	emit Transfer(from, to, tokens);
	40	return true;
	41	}

Counterexample	 This code violates the specification
----------------	--

Initial environment	1	Counter Example:
	2	Before Execution:
	3	Input = {
	4	from = 0x0
	5	to = 0x0
	6	tokens = 0x6c
	7	}
	8	This = 0
	52	}
	53	balance: 0x0
	54	}
	55	}
	56	
Post environment	57	After Execution:
	58	Input = {
	59	from = 0x0
	60	to = 0x0
	61	tokens = 0x6c

## Static Analysis Request

### INSECURE\_COMPILER\_VERSION

Line 1 in File sodacoin.sol

```
1 pragma solidity ^0.4.24;
```

 Only these compiler versions are safe to compile your code: 0.4.25

### TIMESTAMP\_DEPENDENCY

Line 179 in File sodacoin.sol

```
179 return now;
```

 "now" can be influenced by minors to some degree

### TIMESTAMP\_DEPENDENCY

Line 205 in File sodacoin.sol

```
205 if (unlockdate[i].datetime < now) {
```

 "now" can be influenced by minors to some degree

### TIMESTAMP\_DEPENDENCY

Line 220 in File sodacoin.sol

```
220 if (unlockdate[0].datetime > now) {
```

 "now" can be influenced by minors to some degree

### TIMESTAMP\_DEPENDENCY

Line 221 in File sodacoin.sol

```
221 emit RejectedPaymentFromLockedAddr(msg.sender, to, tokens, unlockdate  
[0].datetime, now);
```

 "now" can be influenced by minors to some degree

### INSECURE\_COMPILER\_VERSION

Line 1 in File sodatoken.sol


```
1 pragma solidity ^0.4.24;
```

 Only these compiler versions are safe to compile your code: 0.4.25

## Formal Verification Request 1

SafeMath add

 31, Jan 2019

 18.33 ms

Line 5-9 in File sodacoin.sol

```
5  /*@CTK "SafeMath add"
6      @post (a + b < a || a + b < b) == __reverted
7      @post !__reverted -> c == a + b
8      @post !__reverted -> !__has_overflow
9  */
```

Line 10-13 in File sodacoin.sol


```
10 function safeAdd(uint a, uint b) public pure returns (uint c) {
11     c = a + b;
12     require(c >= a);
13 }
```

 The code meets the specification

## Formal Verification Request 2

SafeMath sub

 31, Jan 2019

 13.41 ms

Line 14-18 in File sodacoin.sol

```
14 /*@CTK "SafeMath sub"
15     @post (a < b) == __reverted
16     @post !__reverted -> c == a - b
17     @post !__reverted -> !__has_overflow
18 */
```

Line 19-22 in File sodacoin.sol


```
19 function safeSub(uint a, uint b) public pure returns (uint c) {
20     require(b <= a);
21     c = a - b;
22 }
```

 The code meets the specification

## Formal Verification Request 3

SafeMath mul

 31, Jan 2019

 139.14 ms

Line 23-28 in File sodacoin.sol

```

23  /*@CTK "SafeMath mul"
24      @post (a > 0) && (((a * b) / a) != b) -> __reverted
25      @post __reverted -> (a > 0) && (((a * b) / a) != b)
26      @post !__reverted -> c == a * b
27      @post !__reverted == !__has_overflow
28  */

```

Line 29-32 in File sodacoin.sol

```

29  function safeMul(uint a, uint b) public pure returns (uint c) {
30      c = a * b;
31      require(a == 0 || c / a == b);
32  }


```

✓ The code meets the specification

## Formal Verification Request 4

SafeMath div

 31, Jan 2019

 15.23 ms

Line 33-37 in File sodacoin.sol

```

33  /*@CTK "SafeMath div"
34      @post b != 0 -> !__reverted
35      @post !__reverted -> c == a / b
36      @post !__reverted -> !__has_overflow
37  */

```

Line 38-41 in File sodacoin.sol

```

38  function safeDiv(uint a, uint b) public pure returns (uint c) {
39      require(b > 0);
40      c = a / b;
41  }


```

✓ The code meets the specification

## Formal Verification Request 5

Ownable

 31, Jan 2019

 5.62 ms

Line 85-87 in File sodacoin.sol

```

85  /*@CTK Ownable
86      @post __post.owner == msg.sender
87  */

```

Line 88-90 in File sodacoin.sol

```
88     constructor() public {
89         owner = msg.sender;
90     }
```

✓ The code meets the specification

## Formal Verification Request 6

### transferOwnership

📅 31, Jan 2019

🕒 14.8 ms

Line 97-101 in File sodacoin.sol

```
97     /*@CTK transferOwnership
98         @tag assume_completion
99         @post owner == msg.sender
100         @post __post.newOwner == _newOwner
101     */
```

Line 102-104 in File sodacoin.sol

```
102     function transferOwnership(address _newOwner) public onlyOwner {
103         newOwner = _newOwner;
104     }
```

✓ The code meets the specification

## Formal Verification Request 7

### acceptOwnership

📅 31, Jan 2019

🕒 17.69 ms

Line 105-110 in File sodacoin.sol

```
105     /*@CTK acceptOwnership
106         @tag assume_completion
107         @post msg.sender == newOwner
108         @post __post.owner == newOwner
109         @post __post.newOwner == address(0)
110     */
```

Line 111-116 in File sodacoin.sol


```
111     function acceptOwnership() public {
112         require(msg.sender == newOwner);
113         emit OwnershipTransferred(owner, newOwner);
114         owner = newOwner;
115         newOwner = address(0);
116     }
```

✓ The code meets the specification

## Formal Verification Request 8

now\_

 31, Jan 2019

 5.33 ms

Line 175-177 in File sodacoin.sol

```
175  /*@CTK now_  
176      @post __return == now  
177  */
```

Line 178-180 in File sodacoin.sol


```
178  function now_() public constant returns (uint){  
179      return now;  
180  }
```

 The code meets the specification

## Formal Verification Request 9

totalSupply

 31, Jan 2019

 7.57 ms

Line 185-187 in File sodacoin.sol

```
185  /*@CTK totalSupply  
186      @post __return == _totalSupply - balances[address(0)]  
187  */
```

Line 188-190 in File sodacoin.sol


```
188  function totalSupply() public constant returns (uint) {  
189      return _totalSupply - balances[address(0)];  
190  }
```

 The code meets the specification

## Formal Verification Request 10

balanceOf

 31, Jan 2019

 5.66 ms

Line 195-197 in File sodacoin.sol

```
195  /*@CTK balanceOf  
196      @post balance == balances[tokenOwner]  
197  */
```

Line 198-200 in File sodacoin.sol

```
198     function balanceOf(address tokenOwner) public constant returns (uint balance) {
199         return balances[tokenOwner];
200     }
```

✓ The code meets the specification

## Formal Verification Request 11

approve

📅 31, Jan 2019

🕒 14.6 ms

Line 253-255 in File sodacoin.sol

```
253     /*@CTK approve
254         @post __post.allowed[msg.sender][spender] == tokens
255     */
```

Line 256-260 in File sodacoin.sol

```
256     function approve(address spender, uint tokens) public returns (bool success) {
257         allowed[msg.sender][spender] = tokens;
258         emit Approval(msg.sender, spender, tokens);
259         return true;
260     }
```

✓ The code meets the specification

## Formal Verification Request 12

allowance

📅 31, Jan 2019

🕒 5.78 ms

Line 268-270 in File sodacoin.sol

```
268     /*@CTK allowance
269         @post remaining == allowed[tokenOwner][spender]
270     */
```

Line 271-273 in File sodacoin.sol

```
271     function allowance(address tokenOwner, address spender) public constant returns (
272         uint remaining) {
273         return allowed[tokenOwner][spender];
274     }
```


✓ The code meets the specification



## Formal Verification Request 13

totalSupplyIncrease

 31, Jan 2019

 66.67 ms

Line 306-310 in File sodacoin.sol

```
306  /*@CTK totalSupplyIncrease
307     @tag assume_completion
308     @post __post._totalSupply == _totalSupply + _supply
309     @post __post.balances[msg.sender] == balances[msg.sender] + _supply
310  */
```

Line 311-314 in File sodacoin.sol


```
311  function totalSupplyIncrease(uint256 _supply) public onlyOwner{
312      _totalSupply = _totalSupply + _supply;
313      balances[msg.sender] = balances[msg.sender] + _supply;
314  }
```

 The code meets the specification

## Formal Verification Request 14

blacklisting

 31, Jan 2019

 20.57 ms

Line 319-323 in File sodacoin.sol

```
319  /*@CTK blacklisting
320     @tag assume_completion
321     @post owner == msg.sender
322     @post __post.blacklist[_addr] == 1
323  */
```

Line 324-327 in File sodacoin.sol


```
324  function blacklisting(address _addr) public onlyOwner{
325      blacklist[_addr] = 1;
326      emit Blacklisted(_addr);
327  }
```

 The code meets the specification

## Formal Verification Request 15

deleteFromBlacklist

 31, Jan 2019

 19.98 ms

Line 333-337 in File sodacoin.sol

```

333  /*@CTK deleteFromBlacklist
334      @tag assume_completion
335      @post owner == msg.sender
336      @post __post.blacklist[_addr] == -1
337  */

```

Line 338-341 in File sodacoin.sol

```

338  function deleteFromBlacklist(address _addr) public onlyOwner{
339      blacklist[_addr] = -1;
340      emit DeleteFromBlacklist(_addr);
341  }


```

✓ The code meets the specification

## Formal Verification Request 16

SafeMath add

 31, Jan 2019

 18.33 ms

Line 5-9 in File sodatoken.sol

```

5  /*@CTK "SafeMath add"
6      @post (a + b < a || a + b < b) == __reverted
7      @post !__reverted -> c == a + b
8      @post !__reverted -> !__has_overflow
9  */

```

Line 10-13 in File sodatoken.sol

```

10  function safeAdd(uint a, uint b) public pure returns (uint c) {
11      c = a + b;
12      require(c >= a);
13  }


```

✓ The code meets the specification

## Formal Verification Request 17

SafeMath sub

 31, Jan 2019

 13.41 ms

Line 14-18 in File sodatoken.sol

```

14  /*@CTK "SafeMath sub"
15      @post (a < b) == __reverted
16      @post !__reverted -> c == a - b
17      @post !__reverted -> !__has_overflow
18  */

```

Line 19-22 in File sodatoken.sol

```

19     function safeSub(uint a, uint b) public pure returns (uint c) {
20         require(b <= a);
21         c = a - b;
22     }

```

✓ The code meets the specification

## Formal Verification Request 18

SafeMath mul

📅 31, Jan 2019

🕒 139.14 ms

Line 23-28 in File sodatoken.sol

```

23     /*@CTK "SafeMath mul"
24         @post (a > 0) && (((a * b) / a) != b) -> __reverted
25         @post __reverted -> (a > 0) && (((a * b) / a) != b)
26         @post !__reverted -> c == a * b
27         @post !__reverted == !__has_overflow
28     */

```

Line 29-32 in File sodatoken.sol

```

29     function safeMul(uint a, uint b) public pure returns (uint c) {
30         c = a * b;
31         require(a == 0 || c / a == b);
32     }

```

✓ The code meets the specification

## Formal Verification Request 19

SafeMath div

📅 31, Jan 2019

🕒 15.23 ms

Line 33-37 in File sodatoken.sol

```

33     /*@CTK "SafeMath div"
34         @post b != 0 -> !__reverted
35         @post !__reverted -> c == a / b
36         @post !__reverted -> !__has_overflow
37     */

```

Line 38-41 in File sodatoken.sol

```

38     function safeDiv(uint a, uint b) public pure returns (uint c) {
39         require(b > 0);
40         c = a / b;
41     }

```

✓ The code meets the specification

## Formal Verification Request 20

### Ownable

31, Jan 2019

5.62 ms

Line 78-80 in File sodatoken.sol

```
78  /*@CTK Ownable
79      @post __post.owner == msg.sender
80  */
```

Line 81-83 in File sodatoken.sol

```
81  constructor() public {
82      owner = msg.sender;
83  }
```

The code meets the specification

## Formal Verification Request 21

### transferOwnership

31, Jan 2019

14.8 ms

Line 90-94 in File sodatoken.sol

```
90  /*@CTK transferOwnership
91      @tag assume_completion
92      @post owner == msg.sender
93      @post __post.newOwner == _newOwner
94  */
```

Line 95-97 in File sodatoken.sol

```
95  function transferOwnership(address _newOwner) public onlyOwner {
96      newOwner = _newOwner;
97  }
```

The code meets the specification

## Formal Verification Request 22

### acceptOwnership

31, Jan 2019

17.69 ms

Line 98-103 in File sodatoken.sol

```
98  /*@CTK acceptOwnership
99      @tag assume_completion
100      @post msg.sender == newOwner
101      @post __post.owner == newOwner
102      @post __post.newOwner == address(0)
103  */
```

Line 104-109 in File sodatoken.sol

```
104  function acceptOwnership() public {
105      require(msg.sender == newOwner);
106      emit OwnershipTransferred(owner, newOwner);
107      owner = newOwner;
108      newOwner = address(0);
109  }
```

✓ The code meets the specification

## Formal Verification Request 23

totalSupply

31, Jan 2019

7.96 ms

Line 143-145 in File sodatoken.sol

```
143  /*@CTK totalSupply
144      @post __return == _totalSupply - balances[address(0)]
145  */
```

Line 146-148 in File sodatoken.sol

```
146  function totalSupply() public constant returns (uint) {
147      return _totalSupply - balances[address(0)];
148  }
```

✓ The code meets the specification

## Formal Verification Request 24

balanceOf

31, Jan 2019

5.9 ms

Line 154-156 in File sodatoken.sol

```
154  /*@CTK balanceOf
155      @post balance == balances[tokenOwner]
156  */
```

Line 157-159 in File sodatoken.sol

```
157  function balanceOf(address tokenOwner) public constant returns (uint balance) {
158      return balances[tokenOwner];
159  }
```

✓ The code meets the specification

## Formal Verification Request 25

transfer

📅 31, Jan 2019

🕒 149.24 ms

Line 167-172 in File sodatoken.sol

```
167  /*@CTK transfer
168      @tag assume_completion
169      @pre to != msg.sender
170      @post __post.balances[msg.sender] == balances[msg.sender] - tokens
171      @post __post.balances[to] == balances[to] + tokens
172  */
```

Line 173-178 in File sodatoken.sol

```
173  function transfer(address to, uint tokens) public returns (bool success) {
174      balances[msg.sender] = safeSub(balances[msg.sender], tokens);
175      balances[to] = safeAdd(balances[to], tokens);
176      emit Transfer(msg.sender, to, tokens);
177      return true;
178  }
```

✓ The code meets the specification

## Formal Verification Request 26

approve

📅 31, Jan 2019

🕒 12.2 ms

Line 185-187 in File sodatoken.sol

```
185  /*@CTK approve
186      @post __post.allowed[msg.sender][spender] == tokens
187  */
```

Line 188-192 in File sodatoken.sol

```
188  function approve(address spender, uint tokens) public returns (bool success) {
189      allowed[msg.sender][spender] = tokens;
190      emit Approval(msg.sender, spender, tokens);
191      return true;
192  }
```

✓ The code meets the specification

## Formal Verification Request 27

transferFrom

31, Jan 2019

199.45 ms

Line 204-210 in File sodatoken.sol

```
204  /*@CTK transferFrom
205     @tag assume_completion
206     @pre to != from
207     @post __post.balances[from] == balances[from] - tokens
208     @post __post.allowed[from][msg.sender] == allowed[from][msg.sender] - tokens
209     @post __post.balances[to] == balances[to] + tokens
210  */
```

Line 211-217 in File sodatoken.sol

```
211  function transferFrom(address from, address to, uint tokens) public returns (bool
      success) {
212      balances[from] = safeSub(balances[from], tokens);
213      allowed[from][msg.sender] = safeSub(allowed[from][msg.sender], tokens);
214      balances[to] = safeAdd(balances[to], tokens);
215      emit Transfer(from, to, tokens);
216      return true;
217  }
```

The code meets the specification

## Formal Verification Request 28

allowance

31, Jan 2019

6.11 ms

Line 224-226 in File sodatoken.sol

```
224  /*@CTK allowance
225     @post remaining == allowed[tokenOwner][spender]
226  */
```

Line 227-229 in File sodatoken.sol


```
227  function allowance(address tokenOwner, address spender) public constant returns (
      uint remaining) {
228      return allowed[tokenOwner][spender];
229  }
```

The code meets the specification

## Formal Verification Request 29

totalSupplyIncrease

 31, Jan 2019

 43.54 ms

Line 260-264 in File sodatoken.sol

```
260  /*@CTK totalSupplyIncrease
261      @tag assume_completion
262      @post __post._totalSupply == _totalSupply + _supply
263      @post __post.balances[msg.sender] == balances[msg.sender] + _supply
264  */
```

Line 265-268 in File sodatoken.sol

```
265  function totalSupplyIncrease(uint256 _supply) public onlyOwner{
266      _totalSupply = _totalSupply + _supply;
267      balances[msg.sender] = balances[msg.sender] + _supply;
268  }
```

 The code meets the specification