ExVul

SMART CONTRACT AUDIT REPORT

Bitgold Smart Contract

SEPTEMBER 2025

Contents

1. EXECUTIVE SUMMARY

ExVul Web3 Security was engaged by **Bitgold** to review smart contract implementation. The assessment was conducted in accordance with our systematic approach to evaluate potential security issues based upon customer requirement. The report provides detailed recommendations to resolve the issue and provide additional suggestions or recommendations for improvement.

The outcome of the assessment outlined in chapter 3 provides the system's owners a full description of the vulnerabilities identified, the associated risk rating for each vulnerability, and detailed recommendations that will resolve the underlying technical issue.

1.1 Methodology

To standardize the evaluation, we define the following terminology based on OWASP Risk Rating Methodology [10] which is the gold standard in risk assessment using the following risk models:

- **Likelihood**: represents how likely a particular vulnerability is to be uncovered and exploited in the wild.
- **Impact**: measures the technical loss and business damage of a successful attack.
- **Severity**: determine the overall criticality of the risk.

Likelihood can be: High, Medium and Low and impact are categorized into: High, Medium, Low, Informational. Severity is determined by likelihood and impact and can be classified into five categories accordingly: Critical, High, Medium, Low, Informational shown in table 1.1.

Likelihood		IMPACT			
		Informational	**Low**	**Medium**	**High**
	High	INFO	MEDIUM	HIGH	CRITICAL
	Medium	INFO	LOW	MEDIUM	HIGH
	Low	INFO	LOW	LOW	MEDIUM

Table 1.1 Overall Risk Severity

To evaluate the risk, we will be going through a list of items, and each would be labelled with a severity category. The audit was performed with a systematic approach guided by a comprehensive assessment list carefully designed to identify known and impactful security issues. If our tool or analysis does not identify any issue, the contract can be considered safe regarding the assessed item. For any discovered issue, we might further deploy contracts on our private test environment and run tests to confirm the findings. If necessary, we would additionally build a PoC to demonstrate the possibility of exploitation. The concrete list of check items is shown in Table 1.2.

- **Basic Coding Bugs**: We first statically analyze given smart contracts with our proprietary static code analyzer for known coding bugs, and then manually verify (reject or confirm) all the issues found by our tool.
- **Code and business security testing**: We further review business logics, examine system operations, and place DeFi-related aspects under scrutiny to uncover possible pitfalls and/or bugs.
- **Additional Recommendations**: We also provide additional suggestions regarding the coding and development of smart contracts from the perspective of proven programming practices.

Category	**Assessment Item**
Basic Coding Assessment	• Apply Verification Control • Authorization Access Control • Forged Transfer Vulnerability • Forged Transfer Notification • Numeric Overflow • Transaction Rollback Attack • Transaction Block Stuffing Attack • Soft Fail Attack • Hard Fail Attack • Abnormal Memo • Abnormal Resource Consumption • Secure Random Number

Advanced Source Code Scrutiny	• Asset Security • Cryptography Security • Business Logic Review • Source Code Functional Verification • Account Authorization Control • Sensitive Information Disclosure • Circuit Breaker • Blacklist Control • System API Call Analysis • Contract Deployment Consistency Check • Abnormal Resource Consumption
Additional Recommendations	• Semantic Consistency Checks • Following Other Best Practices

Table 1.2: The Full List of Assessment Items

To better describe each issue we identified, we categorize the findings with Common Weakness Enumeration (CWE-699) [14], which is a community-developed list of software weakness types to better delineate and organize weaknesses around concepts frequently encountered in software development.

2. FINDINGS OVERVIEW

2.1 Project Info And Contract Address

Project Name	Audit Time	Language
Bitgold	22/09/2025 - 24/09/2025	Solidity

Repository
https://bscscan.com/address/0x4c9027e10c5271efca82379d3123917ae3f2374e

Commit Hash
N/A

2.2 Summary

Severity	Found
CRITICAL	0
HIGH	1
MEDIUM	0
LOW	2
INFO	0

2.3 Key Findings

Severity	Findings Title	Status
HIGH	approve has a race condition	Fixed
LOW	Update allowances events in a timely manner	Fixed
LOW	Missing zero address check	Acknowledge

Table 2.3: Key Audit Findings

3. DETAILED DESCRIPTION OF FINDINGS

3.1 approve has a race condition

SEVERITY: HIGH **STATUS:** Fixed

PATH:

`BitgoldContract.sol`

DESCRIPTION:

approve will directly overwrite the original amount when executed, which may cause a race condition and cause the funds to be overspent.

IMPACT:

Directly overwriting the old authorized amount may cause a race condition, resulting in excessive spending of funds.

RECOMMENDATIONS:

Added the function of increasing and decreasing the limit.

```
+function increaseAllowance(address spender, uint256 addedValue) public
    returns (bool) {
+     require(spender != address(0), ”Spender is the zero address”);
+     uint256 newAllowance = _allowances[msg.sender][spender] + addedValue;
+     _allowances[msg.sender][spender] = newAllowance;
+     emit Approval(msg.sender, spender, newAllowance);
+     return true;
+}

+function decreaseAllowance(address spender, uint256 subtractedValue)
    public returns (bool) {
+     require(spender != address(0), ”Spender is the zero address”);
+     uint256 current = _allowances[msg.sender][spender];
+     require(current >= subtractedValue, ”No verification limit”);
+     uint256 newAllowance = current - subtractedValue;
+    _allowances[msg.sender][spender] = newAllowance;
+    emit Approval(msg.sender, spender, newAllowance);
+    return true;
+}
```

Add verification in approve.

```
function approve(address spender, uint256 amount) public returns (bool) {
+   uint256 current = _allowances[msg.sender][spender];
+   require(amount == 0 || current == 0, ”unsafe Operation”);
    _allowances[msg.sender][spender] = amount;
    emit Approval(msg.sender, spender, amount);
    return true;
}
```

3.2 Update allowances events in a timely manner

SEVERITY: LOW **STATUS:** Fixed

PATH:

`BitgoldContract.sol`

DESCRIPTION:

After executing transferFrom, the amount of third-party authorization will be reduced, but no event is issued to record it.

IMPACT:

This could make it difficult to track allowance changes in off-chain monitoring systems.

RECOMMENDATIONS:

Emit Approval event after updating allowances in transferFrom.

```
function transferFrom(address sender, address recipient, uint256 amount)
    public returns (bool) {
     require(sender != address(0), ”Sender is the zero address”);
     require(recipient != address(0), ”Recipient is the zero address”);
     require(_balances[sender] >= amount, ”Sender has insufficient
    balance”);
     require(_allowances[sender][msg.sender] >= amount, ”Allowance is
    insufficient”);

     _allowances[sender][msg.sender] -= amount;
     _balances[sender] -= amount;
     _balances[recipient] += amount;
+    emit Approval(sender, msg.sender, _allowances[sender][msg.sender]);
     emit Transfer(sender, recipient, amount);
     return true;
}
```

3.3 Missing zero address check

SEVERITY: LOW **STATUS:** Acknowledge

PATH:

`BitgoldContract.sol`

DESCRIPTION:

Allowing users to pass in a zero address as a spender when executing approve authorization may affect user experience.

IMPACT:

The user mistakenly authorized the quota to the zero address, affecting the user experience.

RECOMMENDATIONS:

Add spender address verification.

```
function approve(address spender, uint256 amount) public returns (bool) {
+   require(spender != address(0), ”Spender is the zero address”);
    _allowances[msg.sender][spender] = amount;
    emit Approval(msg.sender, spender, amount);
    return true;
}
```

4. CONCLUSION

In this audit, we thoroughly analyzed **Bitgold** smart contract implementation. The problems found are described and explained in detail in Section 3. The problems found in the audit have been communicated to the project leader. We therefore consider the audit result to be **PASSED**.

To improve this report, we greatly appreciate any constructive feedbacks or suggestions, on our methodology, audit findings, or potential gaps in scope/coverage.

5. APPENDIX

5.1 Basic Coding Assessment

5.1.1 Apply Verification Control

Description	The security of apply verification
Result	Not found
Severity	CRITICAL

5.1.2 Authorization Access Control

Description	Permission checks for external integral functions
Result	Not found
Severity	CRITICAL

5.1.3 Forged Transfer Vulnerability

Description	Assess whether there is a forged transfer notification vulnerability in the contract
Result	Not found
Severity	CRITICAL

5.1.4 Transaction Rollback Attack

Description	Assess whether there is transaction rollback attack vulnerability in the contract
Result	Not found
Severity	CRITICAL

5.1.5 Transaction Block Stuffing Attack

Description	Assess whether there is transaction blocking attack vulnerability
Result	Not found
Severity	CRITICAL

5.1.6 Soft Fail Attack Assessment

Description	Assess whether there is soft fail attack vulnerability
Result	Not found
Severity	CRITICAL

5.1.7 Hard Fail Attack Assessment

Description	Examine for hard fail attack vulnerability
Result	Not found
Severity	CRITICAL

5.1.8 Abnormal Memo Assessment

Description	Assess whether there is abnormal memo vulnerability in the contract
Result	Not found
Severity	CRITICAL

5.1.9 Abnormal Resource Consumption

Description	Examine whether abnormal resource consumption in contract processing
Result	Not found
Severity	CRITICAL

5.1.10 Random Number Security

Description	Examine whether the code uses insecure random number
Result	Not found
Severity	CRITICAL

5.2 Advanced Code Scrutiny

5.2.1 Cryptography Security

Description	Examine for weakness in cryptograph implementation
Result	Not found
Severity	HIGH

5.2.2 Account Permission Control

Description	Examine permission control issue in the contract
Result	Not found
Severity	MEDIUM

5.2.3 Malicious Code Behavior

Description	Examine whether sensitive behavior present in the code
Result	Not found
Severity	MEDIUM

5.2.4 Sensitive Information Disclosure

Description	Examine whether sensitive information disclosure issue present in the code
Result	Not found
Severity	MEDIUM

5.2.5 System API

Description	Examine whether system API application issue present in the code
Result	Not found
Severity	LOW

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This report should not be used in any way to make decisions around investment or involvement with any particular project. This report in no way provides investment advice, nor should be leveraged as investment advice of any sort. This report represents an extensive assessing process intending to help our customers increase the quality of their code while reducing the high level of risk presented by cryptographic tokens and blockchain technology.

Blockchain technology and cryptographic assets present a high level of ongoing risk. ExVul's position is that each company and individual are responsible for their own due diligence and continuous security. ExVul's goal is to help reduce the attack vectors and the high level of variance associated with utilizing new and consistently changing technologies, and in no way claims any guarantee of security or functionality of the technology we agree to analyze.

7. REFERENCES

[1] MITRE. CWE-191: Integer Underflow (Wrap or Wraparound). https://cwe.mitre.org/data/definitions/191.html.

[2] MITRE. CWE-197: Numeric Truncation Error. https://cwe.mitre.org/data/definitions/197.html.

[3] MITRE. CWE-400: Uncontrolled Resource Consumption. https://cwe.mitre.org/data/definitions/400.html.

[4] MITRE. CWE-440: Expected Behavior Violation. https://cwe.mitre.org/data/definitions/440.html.

[5] MITRE. CWE-684: Protection Mechanism Failure. https://cwe.mitre.org/data/definitions/693.html.

[6] MITRE. CWE CATEGORY: 7PK - Security Features. https://cwe.mitre.org/data/definitions/254.html.

[7] MITRE. CWE CATEGORY: Behavioral Problems. https://cwe.mitre.org/data/definitions/438.html.

[8] MITRE. CWE CATEGORY: Numeric Errors. https://cwe.mitre.org/data/definitions/189.html.

[9] MITRE. CWE CATEGORY: Resource Management Errors. https://cwe.mitre.org/data/definitions/399.html.

[10] OWASP. Risk Rating Methodology. https://www.owasp.org/index.php/OWASP_Risk_Rating_Methodology

8. About Exvul Security

Premier Security for the Web3 Ecosystem

ExVul is a premier Web3 security firm committed to forging a secure and trustworthy decentralized ecosystem. Our elite team consists of security veterans from world-leading technology and blockchain security firms, including Huawei, YBB Captical, Qihoo 360, Amber, ByteDance, MoveBit, and PeckShield. Team member Nolan is ranked as a top-40 whitehat on Immunefi and is the platform's sole All-Star in the APAC region.

Our expertise covers the full spectrum of Web3 security. We conduct **meticulous smart contract audits**, having fortified thousands of projects on chains like Evm, Solana, Aptos, Sui etc. Our **Blockchain Protocol Audits** secure the core infrastructure of L1/L2 by uncovering deep-seated vulnerabilities. We also offer **comprehensive wallet audits** to protect user assets and provide **proactive web3 pentest**, enabling partners to neutralize threats before they strike.

Trusted by industry leaders, ExVul is the security partner for **OKX, Bitget, Cobo, Infini, Stacks, Aptos, Sui, CoreDAO, Sei** etc.

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