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Blockchain Security | Smart Contract Audits | KYC

MADE IN GERMANY

ZenCats

Audit

Security Assessment

14. March, 2022

For

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Version	Date	Description
1.0	14. March 2022	• Layout project • Automated- /Manual-Security Testing • Summary

Network
Binance Smart Chain (BEP20)

Website
https://zencats.io/

Twitter
https://twitter.com/zencats_nft

Discord
https://discord.gg/5nVaD2NYhm

Description

ZenCats is building **awareness** around the art of **mindful living**. Using art and technology to build **interactive digital journeys and products** to allow its holders to obtain and experience such knowledge through interacting with the NFTs. Using the **staking and evolving mechanism**, holders will have to progress through various stages of zen to reach the **ZenMaster stage**

Project Engagement

During the 4th of March 2022, **ZenCats Team** engaged Solidproof.io to audit smart contracts that they created. The engagement was technical in nature and focused on identifying security flaws in the design and implementation of the contracts. They provided Solidproof.io with access to their code repository and whitepaper.

Logo

Contract Link

v1.0

- Provided as files

Vulnerability & Risk Level

Risk represents the probability that a certain source-threat will exploit vulnerability, and the impact of that event on the organization or system. Risk Level is computed based on CVSS version 3.0.

Level	Value	Vulnerability	Risk (Required Action)
Critical	9 - 10	A vulnerability that can disrupt the contract functioning in a number of scenarios, or creates a risk that the contract may be broken.	Immediate action to reduce risk level.
High	7 – 8.9	A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way.	Implementation of corrective actions as soon aspossible.
Medium	4 – 6.9	A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.	Implementation of corrective actions in a certain period.
Low	2 – 3.9	A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.	Implementation of certain corrective actions or accepting the risk.
Informational	0 – 1.9	A vulnerability that have informational character but is not effecting any of the code.	An observation that does not determine a level of risk

Auditing Strategy and Techniques Applied

Throughout the review process, care was taken to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices. To do so, reviewed line-by-line by our team of expert pentesters and smart contract developers, documenting any issues as there were discovered.

Methodology

The auditing process follows a routine series of steps:

1. Code review that includes the following:
    i) Review of the specifications, sources, and instructions provided to SolidProof to make sure we understand the size, scope, and functionality of the smart contract.
    ii) Manual review of code, which is the process of reading source code line-by-line in an attempt to identify potential vulnerabilities.
    iii) Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to SolidProof describe.

2. Testing and automated analysis that includes the following:
    i) Test coverage analysis, which is the process of determining whether the test cases are actually covering the code and how much code is exercised when we run those test cases.
    ii) Symbolic execution, which is analysing a program to determine what inputs causes each part of a program to execute.

3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.

4. Specific, itemized, actionable recommendations to help you take steps to secure your smart contracts.

Used Code from other Frameworks/Smart Contracts (direct imports)

Imported packages:

Dependency / Import Path	Count
@openzeppelin/contracts/access/AccessControl.sol	1
@openzeppelin/contracts/access/Ownable.sol	4
@openzeppelin/contracts/token/ERC721/ERC721.sol	1
@openzeppelin/contracts/token/ERC721/extensions/ERC721Enumerable.sol	1
@openzeppelin/contracts/utils/Counters.sol	1
@openzeppelin/contracts/utils/Strings.sol	4
@openzeppelin/contracts/utils/math/Math.sol	1
@openzeppelin/contracts/utils/math/SafeMath.sol	1

Tested Contract Files

This audit covered the following files listed below with a SHA-1 Hash.

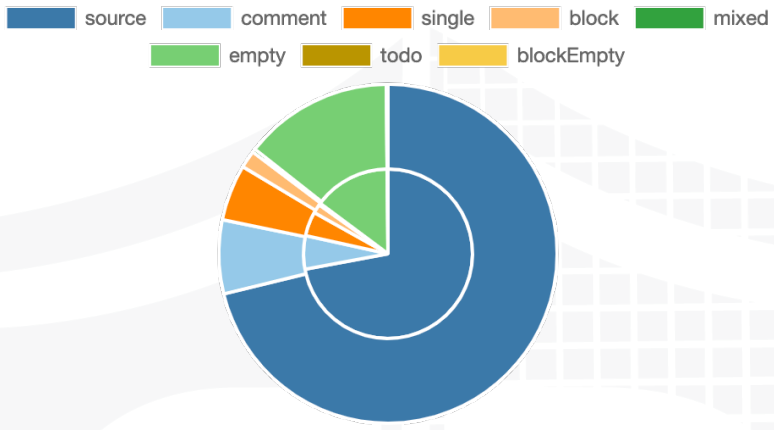
A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

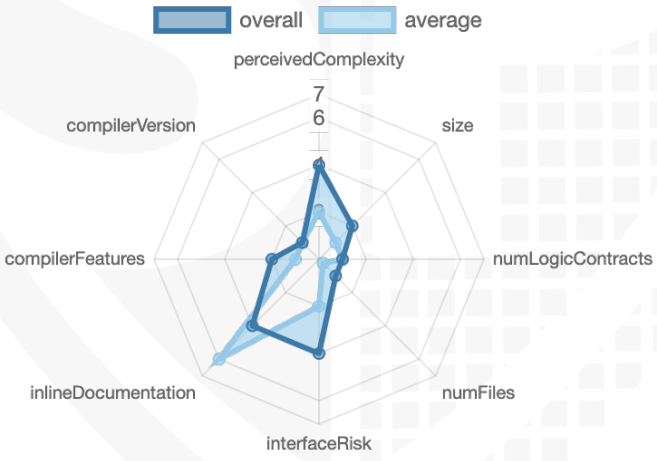
File Name	SHA-1 Hash
contracts/ZenCatsFactory.sol	681fc3d2855bc4e511ca43d5c093584efda4096c
contracts/WhiteList.sol	87d442c413c98ff13327fa5e3c6c444eacb45900
contracts/ZenCats.sol	1486a35fbcd75233a7a9a3638aa6048f9cca4800
contracts/ZenCatsEvolve.sol	2b5fe3fac9805400f9c6519e8e8cebfa5a3c63b3

Metrics

Source Lines
v1.0



Risk Level
v1.0



Capabilities

Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	4	0	0	0

Exposed Functions

This section lists functions that are explicitly declared public or payable. Please note that getter methods for public stateVars are not included.

Version	Public	Payable
1.0	34	3

Version	External	Internal	Private	Pure	View
1.0	11	27	2	3	14

State Variables

Version	Total	Public
1.0	28	18

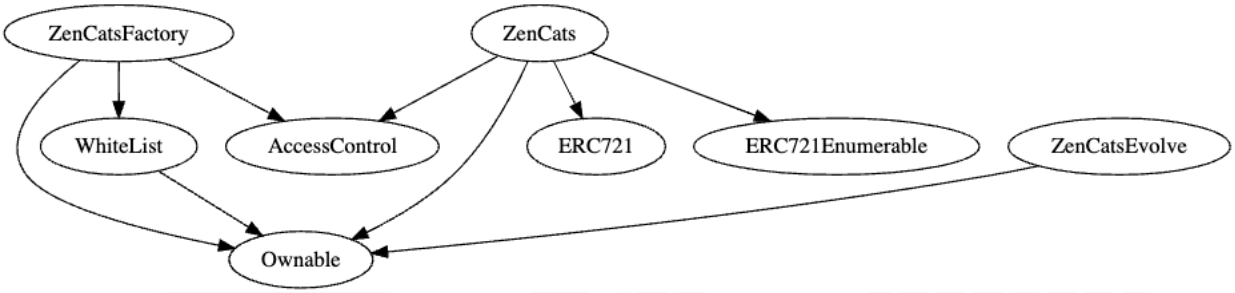
Capabilities

Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts
1.0	`0.8.1`		`yes`		

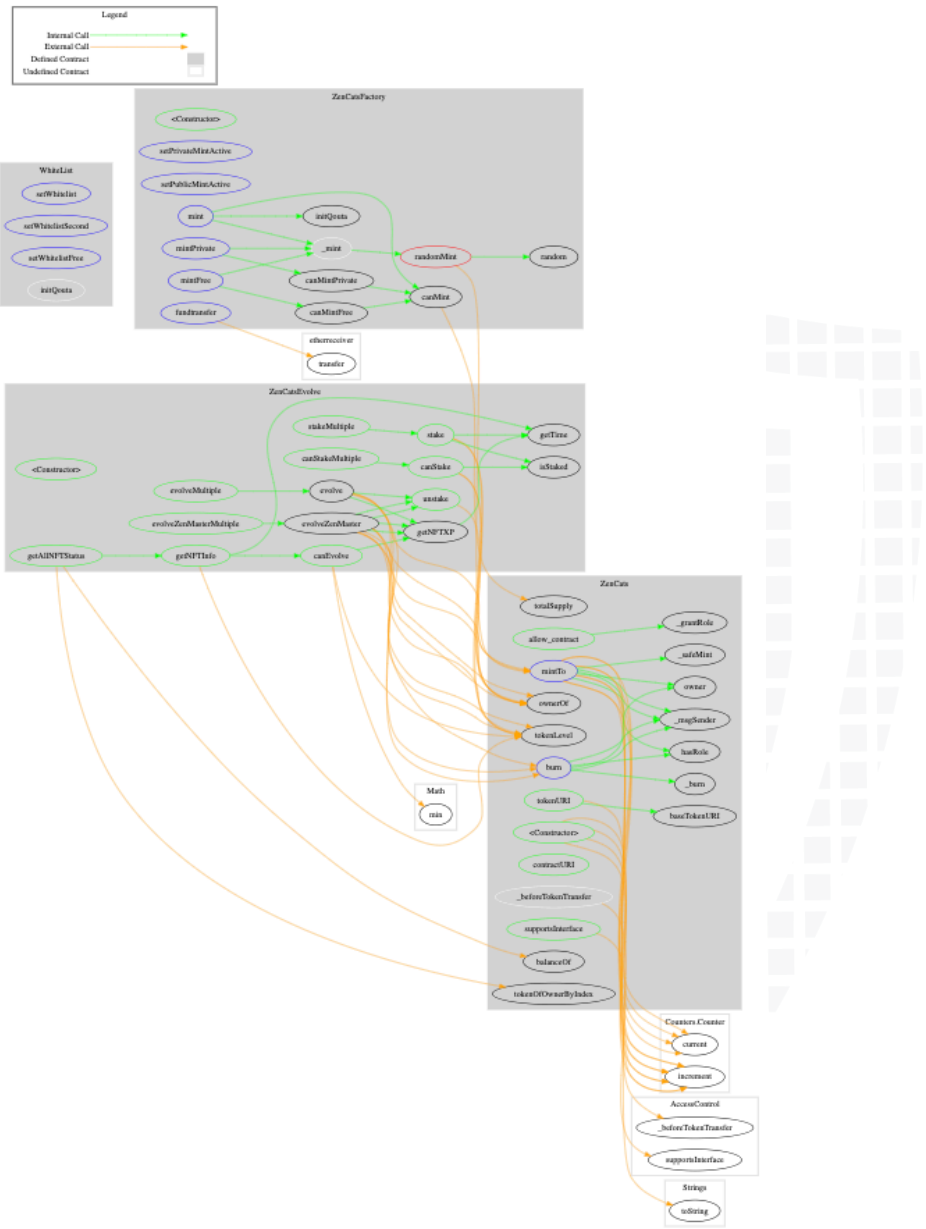
Version	Transfers ETH	Low-Level Calls	DelegateCall	Uses Hash Functions	ECRecover	New/Create/Create2
1.0	`yes`			`yes`		

Inheritance Graph

v1.0



CallGraph
v1.0



Scope of Work/Verify Claims

The above token Team provided us with the files that needs to be tested (Github, Bscscan, Etherscan, files, etc.). The scope of the audit is the main contract (usual the same name as team appended with .sol).

We will verify the following claims:

1. Correct implementation of Token standard
2. Deployer cannot mint any new tokens
3. Deployer cannot burn or lock user funds
4. Deployer cannot pause the contract
5. Overall checkup (Smart Contract Security)

Correct implementation of Token standard

ERC721				
Function	**Description**	**Exist**	**Tested**	**Verified**
BalanceOf	Count all NFTs assigned to an owner	✓	✓	✓
OwnerOf	Find the owner of an NFT	✓	✓	✓
SafeTransferFrom	Transfers the ownership of an NFT from one address to another address	✓	✓	✓
SafeTransferFrom	See above - Difference is that this function has an extra data parameter	✓	✓	✓
TransferFrom	Transfer ownership of an NFT	✓	✓	✓
Approve	Change or reaffirm the approved address for an NFT	✓	✓	✓
SetApprovalForAll	Enable or disable approval for a third party ("operator") to manage all of `msg.sender`'s assets	✓	✓	✓
GetApproved	Get the approved address for a single NFT	✓	✓	✓
IsApprovedForAll	Query if an address is an authorized operator for another address	✓	✓	✓
SupportsInterface	Query if a contract implements an interface	✓	✓	✓
Name	Provides information about the name	✓	✓	✓
Symbol	Provides information about the symbol	✓	✓	✓
TokenURI	Provides information about the TokenUri	✓	✓	✓

Write functions of contract v1.0

setWhitelist
setWhitelistSecond
setWhitelistFree

allow_contract
mintTo
burn

stake
stakeMultiple
unstake
evolveMultiple
evolve
evolveZenMasterMultiple
evolveZenMaster

setPrivateMintActive
setPublicMintActive
fundtransfer
mint 💰
mintPrivate 💰
mintFree 💰

Deployer cannot mint any new tokens

Name	Exist	Tested	Status
Deployer cannot mint	✓	✓	✗

Comments:

v1.0

- Deployer can mint
- Everybody can mint in ZenCatsFactory but the owner is able to disable to call this function

Deployer cannot burn or lock user funds

Name	Exist	Tested	Status
Deployer cannot lock	✓	✓	✓
Deployer cannot burn	✓	✓	✗

Comments:

v1.0

- Deployer and address with role associate_contract_role can burn tokens

Deployer cannot pause the contract

Name	Exist	Tested	Status
Deployer cannot pause	–	–	–

Overall checkup (Smart Contract Security)

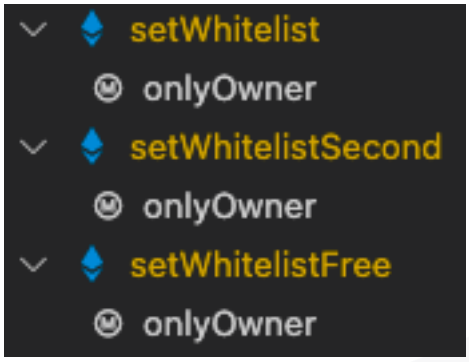
Tested	Verified
✓	✓

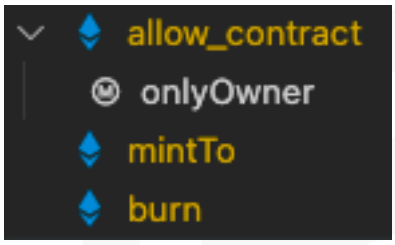
Legend

Attribute	Symbol
Verfified / Checked	✓
Partly Verified	⚑
Unverified / Not checked	✗
Not available	-

Modifiers and public functions

v1.0





Comments

- Deployer can set following state variables without any limitations

- Deployer can enable/disable following state variables
  - whiteListQouta

    - whiteListSecondQouta
    - whiteListFreeQouta
    - privateMintActive
    - publicMintActive

- Deployer can set following addresses

- Deployer can
    - grant associate_contract_role role to certain address
    - Transfer a certain amount to an address
- Associate_contrace_role or Owner can
    - Mint new tokens
    - Burn tokens

Please check if an OnlyOwner or similar restrictive modifier has been forgotten.

Source Units in Scope
v1.0

Type	File	Logic Contracts	Interfaces	Lines	nLines	nSLOC	Comment Lines	Complex. Score	Capabilities
📝	contracts/ZenCatsFactory.sol	1	————	172	172	120	19	98	💰🔀🧱
📝	contracts/WhiteList.sol	1	————	56	56	40	1	39	————
📝	contracts/ZenCats.sol	1	————	124	117	83	21	77	🧱
📝	contracts/ZenCatsEvolve.sol	1	————	198	193	175	1	171	————
📝	**Totals**	**4**	————	**550**	**538**	**418**	**42**	**385**	💰🔀🧱

Legend

Attribute	Description
Lines	total lines of the source unit
nLines	normalized lines of the source unit (e.g. normalizes functions spanning multiple lines)
nSLOC	normalized source lines of code (only source-code lines; no comments, no blank lines)
Comment Lines	lines containing single or block comments
Complexity Score	a custom complexity score derived from code statements that are known to introduce code complexity (branches, loops, calls, external interfaces, ...)

Audit Results

AUDIT PASSED

Critical issues

No critical issues

High issues

No high issues

Medium issues

No medium issues

Low issues

Issue	File	Type	Line	Description
#1	Main	Contract doesn't import npm packages from source (like OpenZeppelin etc.)	-	We recommend to import all packages from npm directly without flatten the contract. Functions could be modified or can be susceptible to vulnerabilities
#2	ZenCats Evolve	Missing Zero Address Validation (missing-zero-check)	29, 35	Check that the address is not zero
#3	ZenCats	State variable visibility is not set	28, 29, 30, 31	It is best practice to set the visibility of state variables explicitly
#4	ZenCats Evolve	State variable visibility is not set	35	It is best practice to set the visibility of state variables explicitly
#5	ZenCats Factory	State variable visibility is not set	19	It is best practice to set the visibility of state variables explicitly

#6	ZenCats	Tautology or contradiction	59	Fix the incorrect comparison by changing the value type or the comparison.

Informational issues

Issue	File	Type	Line	Description
#1	ZenCats	State variables that could be declared constant (constable-states)	28, 29, 30, 31,	Add the `constant` attributes to state variables that never change
#2	ZenCats Factory	State variables that could be declared constant (constable-states)	25	Add the `constant` attributes to state variables that never change
#3	WhiteList	Missing error message	16, 24, 35	Provide an error message for the require statement
#4	ZenCats Factory	Missing error message	109, 112, 126, 127, 146	Provide an error message for the require statement
#5	ZenCats	Wrong visibility order	99	Visibility modifier “public” should come before other modifiers
#6	ZenCats Evolve	Wrong visibility order	50, 59	Visibility modifier “public” should come before other modifiers
#7	ZenCats Evolve	Wrong comment or condition	72	Please check the comment/ condition here. There is a comment with “You can not stake a level 3” but you also cannot stake a level 2 because of the operator “<“. If you want to include level 2 to stake here you either change 2 to or change the operator from “<“ to “<=“

Commented Code exist

There are some instances of code being commented out in the following files that should be removed:

File	Line	Comment

ZenCats	40-44	// function totalSupply() public view returns (uint256) { // return _nextTokenIdLevel0.current() + // _nextTokenIdLevel1.current() + // _nextTokenIdLevel2.current() - 3; // }

	116-123	// function _msgSender()
		// internal
		// override(Context,ERC721Tradable)
		// view
		// returns (address sender)
		// {
		// return ERC721Tradable._msgSender();
		// }

ZenCatsFactory	57-65	// function setSingleMintPrice(uint256 value) external onlyOwner {
		// singleMintPrice = value;
		// }
		// function setPack2MintPrice(uint256 value) external onlyOwner {
		// pack2MintPrice = value;
		// }
		// function setPack4MintPrice(uint256 value) external onlyOwner {
		// pack4MintPrice = value;
		// }

Recommendation

Remove the commented code, or address them properly.

Audit Comments

We recommend you to use the special form of comments (NatSpec Format, Follow link for more information https://docs.soliditylang.org/en/v0.5.10/natspec-format.html) for your contracts to provide rich documentation for functions, return variables and more. This helps investors to make clear what that variables, functions etc. do.

14. March 2022:

- Read whole report for more information

SWC Attacks

ID	Title	Relationships	Status
SWC-136	Unencrypted Private Data On-Chain	CWE-767: Access to Critical Private Variable via Public Method	PASSED
SWC-135	Code With No Effects	CWE-1164: Irrelevant Code	PASSED
SWC-134	Message call with hardcoded gas amount	CWE-655: Improper Initialization	PASSED
SWC-133	Hash Collisions With Multiple Variable Length Arguments	CWE-294: Authentication Bypass by Capture-replay	PASSED
SWC-132	Unexpected Ether balance	CWE-667: Improper Locking	PASSED
SWC-131	Presence of unused variables	CWE-1164: Irrelevant Code	PASSED
SWC-130	Right-To-Left-Override control character (U+202E)	CWE-451: User Interface (UI) Misrepresentation of Critical Information	PASSED
SWC-129	Typographical Error	CWE-480: Use of Incorrect Operator	PASSED
SWC-128	DoS With Block Gas Limit	CWE-400: Uncontrolled Resource Consumption	PASSED

SWC-127	Arbitrary Jump with Function Type Variable	CWE-695: Use of Low-Level Functionality	PASSED
SWC-125	Incorrect Inheritance Order	CWE-696: Incorrect Behavior Order	PASSED
SWC-124	Write to Arbitrary Storage Location	CWE-123: Write-what-where Condition	PASSED
SWC-123	Requirement Violation	CWE-573: Improper Following of Specification by Caller	PASSED
SWC-122	Lack of Proper Signature Verification	CWE-345: Insufficient Verification of Data Authenticity	PASSED
SWC-121	Missing Protection against Signature Replay Attacks	CWE-347: Improper Verification of Cryptographic Signature	PASSED
SWC-120	Weak Sources of Randomness from Chain Attributes	CWE-330: Use of Insufficiently Random Values	PASSED
SWC-119	Shadowing State Variables	CWE-710: Improper Adherence to Coding Standards	PASSED
SWC-118	Incorrect Constructor Name	CWE-665: Improper Initialization	PASSED
SWC-117	Signature Malleability	CWE-347: Improper Verification of Cryptographic Signature	PASSED

SWC-116	Timestamp Dependence	CWE-829: Inclusion of Functionality from Untrusted Control Sphere	PASSED
SWC-115	Authorization through tx.origin	CWE-477: Use of Obsolete Function	PASSED
SWC-114	Transaction Order Dependence	CWE-362: Concurrent Execution using Shared Resource with Improper Synchronization ('Race Condition')	PASSED
SWC-113	DoS with Failed Call	CWE-703: Improper Check or Handling of Exceptional Conditions	PASSED
SWC-112	Delegatecall to Untrusted Callee	CWE-829: Inclusion of Functionality from Untrusted Control Sphere	PASSED
SWC-111	Use of Deprecated Solidity Functions	CWE-477: Use of Obsolete Function	PASSED
SWC-110	Assert Violation	CWE-670: Always-Incorrect Control Flow Implementation	PASSED
SWC-109	Uninitialized Storage Pointer	CWE-824: Access of Uninitialized Pointer	PASSED
SWC-108	State Variable Default Visibility	CWE-710: Improper Adherence to Coding Standards	NOT PASSED
SWC-107	Reentrancy	CWE-841: Improper Enforcement of Behavioral Workflow	PASSED
SWC-106	Unprotected SELFDESTRUCT Instruction	CWE-284: Improper Access Control	PASSED

SWC-105	Unprotected Ether Withdrawal	CWE-284: Improper Access Control	PASSED
SWC-104	Unchecked Call Return Value	CWE-252: Unchecked Return Value	PASSED
SWC-103	Floating Pragma	CWE-664: Improper Control of a Resource Through its Lifetime	PASSED
SWC-102	Outdated Compiler Version	CWE-937: Using Components with Known Vulnerabilities	PASSED
SWC-101	Integer Overflow and Underflow	CWE-682: Incorrect Calculation	PASSED
SWC-100	Function Default Visibility	CWE-710: Improper Adherence to Coding Standards	PASSED

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