CERTIK

Security Assessment

Axelarnetwork

Apr 22nd, 2022

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Summary

This report has been prepared for Axelarnetwork to discover issues and vulnerabilities in the source code of the Axelarnetwork project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Static Analysis and Manual Review techniques.

The auditing process pays special attention to the following considerations:

- Testing the smart contracts against both common and uncommon attack vectors.
- Assessing the codebase to ensure compliance with current best practices and industry standards.
- Ensuring contract logic meets the specifications and intentions of the client.
- Cross referencing contract structure and implementation against similar smart contracts produced by industry leaders.
- Thorough line-by-line manual review of the entire codebase by industry experts.

The security assessment resulted in findings that ranged from critical to informational. We recommend addressing these findings to ensure a high level of security standards and industry practices. We suggest recommendations that could better serve the project from the security perspective:

- Enhance general coding practices for better structures of source codes;
- Add enough unit tests to cover the possible use cases;
- Provide more comments per each function for readability, especially contracts that are verified in public;
- Provide more transparency on privileged activities once the protocol is live.

Overview

Project Summary

Project Name	Axelarnetwork
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/axelarnetwork/solidity-cgp-gateway
Commit	

Audit Summary

Delivery Date	Apr 22, 2022 UTC
Audit Methodology	Static Analysis, Manual Review

Vulnerability Summary

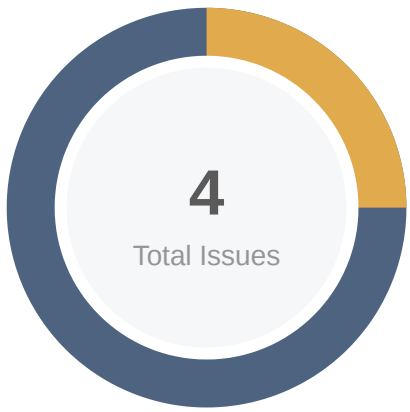
Vulnerability Level	Total	Pending	Declined	Acknowledged	Mitigated	Partially Resolved	Resolved
Critical	0	0	0	0	0	0	0
Major	0	0	0	0	0	0	0
Medium	1	0	0	0	0	0	1
Minor	0	0	0	0	0	0	0
Informational	3	0	0	3	0	0	0
Discussion	0	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
AGM	AxelarNetwork/contracts/AxelarGatewayMultisig.sol	2c669ac6b63ff27c4e037295949a90af9c93dbabc52679d6e5f9a41550ea6085
IER	AxelarNetwork/contracts/interfaces/IERC20.sol	32a03a4f2c670cf3868650db4d33d12510c4b23d2ed210c7fbe87010a9cea5df
AGS	AxelarNetwork/contracts/AxelarGatewaySinglesig.sol	024460b984c81a8651e2b0fcafba8d803fe4cd8e5f926f93a74bac4d118ed196
ANK	AxelarNetwork/contracts/util	
AGA	AxelarNetwork/contracts/AxelarGateway.sol	b939479c0adc00d513cfc0e4a831e85d69c94c8d99f6cc1d8570800cebf2f3d3
CAN	AxelarNetwork/contracts/Context.sol	74822d543f5485c90607cd393ed0a51379adeb97a4365315bca3aef6131a010f
AFA	AxelarNetwork/contracts/util/AddressFormat.sol	b0a6c4ec792e93ef12f4d8ed447224018f9ba98cd21b9d1df690d7e23d946fb1
ESA	AxelarNetwork/contracts/EternalStorage.sol	c27a1ecacaf28715baf068147b770ffbdf612f4b44dfe5c3067d43341e08bea1
IAS	AxelarNetwork/contracts/interfaces/IAxelarGatewaySinglesig.sol	2b6582375d61ddd6e37a234a19b1921df2e2ad29709b384ffd162b7cdbbabcb5
ANC	AxelarNetwork/contracts/interfaces	
IAM	AxelarNetwork/contracts/interfaces/IAxelarGatewayMultisig.sol	520bbafa346817594ebb661fe515142e4bcddc3b862718a9eb9aaa2226cc965e
DHA	AxelarNetwork/contracts/DepositHandler.sol	e1de312c21bbbb0c087972e1d1d581069d2f1083a35f8f14418ac601abf0d487
IEC	AxelarNetwork/contracts/interfaces/IERC20BurnFrom.sol	1e3162d6cc4e51903fc5f0484e7611dca973d74425b0a3a7027d0df59771de96
TDA	AxelarNetwork/contracts/TokenDeployer.sol	3392ead2485c8deac3e5fbf296b6e1f08c48a6f26804069b7e01b93df30deb07
ERP	AxelarNetwork/contracts/ERC20Permit.sol	6639079c2a6ebf8128cd6ff47821f6931ac35dfd54580084807b873333f12561
AMB	AxelarNetwork/contracts/AdminMultisigBase.sol	4bbf10c558f953bff3536d0d88d69c712b249968715ed43d8ea7e9c4b1a5cfde

ID	File	SHA256 Checksum
OAN	AxelarNetwork/contracts/Ownable.sol	d069d2a157af014f7a218fda322b12ec6ee42ca5c1ce304f0882f2cccd0589fb
MCE	AxelarNetwork/contracts/MintableCappedERC20.sol	6866b32898fd047b78012abe0ba8cffa17c7b30234552c5eb1535b8eabb5ac82
IAE	AxelarNetwork/contracts/interfaces/IAxelarExecutable.sol	eda71300473f064ae00772ecc890da9e3b23a77a6260493fb7a74520c1e2d1d1
BMC	AxelarNetwork/contracts/BurnableMintableCappedERC20.sol	266b8b5301786d2f2671c14a029b4e322f586e4649a3cc2f0891520bfb54fc8d
ECD	AxelarNetwork/contracts/ECDSA.sol	d55489743abf362b026b9904bf42ef3af56066907dc7490a1514e6645ae8089c
IAG	AxelarNetwork/contracts/interfaces/IAxelarGateway.sol	55d779d46a44d5d61f9107d043d3cd858fcc6756b15a5639a906b5b8b108a398
ERC	AxelarNetwork/contracts/ERC20.sol	f381288a2d30096e193233269a3662884babf26fd1ecf1dd209c7fed1bb20a2c
AGP	AxelarNetwork/contracts/AxelarGatewayProxy.sol	b229ce5feaab0a356607c8c4bf1ba2f0aea29254a959d0b5c76f83296e996741

Findings



Critical	**0** (0.00%)
Major	**0** (0.00%)
Medium	**1** (25.00%)
Minor	**0** (0.00%)
Informational	**3** (75.00%)
Discussion	**0** (0.00%)

ID	Title	Category	Severity	Status
AGA-01	`freezeToken` Doesn't Affect `TokenType.External` Tokens	Logical Issue	Medium	Resolved
AGA-02	It's Better To Set A Time Delay	Logical Issue	Informational	Acknowledged
AGA-03	`TokenType.InternalBurnable` Token Doesn't Exist	Logical Issue	Informational	Acknowledged
AGM-01	It's Better To Set A Min Threshold	Logical Issue	Informational	Acknowledged

AGA-01 | `freezeToken` Doesn't Affect `TokenType.External` Tokens

Category	Severity	Location	Status
Logical Issue	Medium	AxelarNetwork/contracts/AxelarGateway.sol: 229, 336	Resolved

Description

If the `KEY_ALL_TOKENS_FROZEN` value is true or a `TokenType.External` token is frozen, the function `_burnTokenFrom` and `_mintToken` can still be called successfully, but other types of tokens will be failed.

Recommendation

We recommend fixing this logic issue.

Alleviation

Fixed in commit `4067ed6c8f7e8d5d09d94d6b7301919aff2cb8fc`.

AGA-02 | It's Better To Set A Time Delay

Category	Severity	Location	Status
Logical Issue	Informational	AxelarNetwork/contracts/AxelarGateway.sol: 203	Acknowledged

Description

The function `upgrade` can upgrade the implementation of the contract; although it is managed by multi admins, it's better to add a time delay when upgrading the contract.

Recommendation

We recommend adding a time delay of at least 48 hours to upgrade the contract.

AGA-03 | `TokenType.InternalBurnable` Token Doesn't Exist

Category	Severity	Location	Status
Logical Issue	Informational	AxelarNetwork/contracts/AxelarGateway.sol: 264~276	Acknowledged

Description

`TokenType.InternalBurnable` tokens are not deployed in this contract.

Recommendation

We advise explaining to users.

Alleviation

[Axelar Network] `InternalBurnable` token type is purely around for backwards compatibility for tokens that were deployed in `v1.0.0` of the contracts.

AGM-01 | It's Better To Set A Min Threshold

Category	Severity	Location	Status
Logical Issue	Informational	AxelarNetwork/contracts/AxelarGatewayMultisig.sol: 401, 413, 435, 439, 443	Acknowledged

Description

In the `setup` function, the valid min threshold(`adminThreshold`/`ownerThreshold`/`operatorThreshold`) is `1`; because it's multi-sign, it's better to set a multi number like `3`.

Recommendation

We recommend adding validation to ensure the minimum threshold is at least three.

Alleviation

[Axelar Network] Allowing the threshold to be 1 allows support for single sig easily (threshold signatures) in the future with the same contract. Also, the contracts are not made more restrictive than the network itself to avoid a state mismatch between the gateway and the network.

Appendix

Finding Categories

Logical Issue

Logical Issue findings detail a fault in the logic of the linked code, such as an incorrect notion on how block.timestamp works.

Checksum Calculation Method

The "Checksum" field in the "Audit Scope" section is calculated as the SHA-256 (Secure Hash Algorithm 2 with digest size of 256 bits) digest of the content of each file hosted in the listed source repository under the specified commit.

The result is hexadecimal encoded and is the same as the output of the Linux "sha256sum" command against the target file.

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