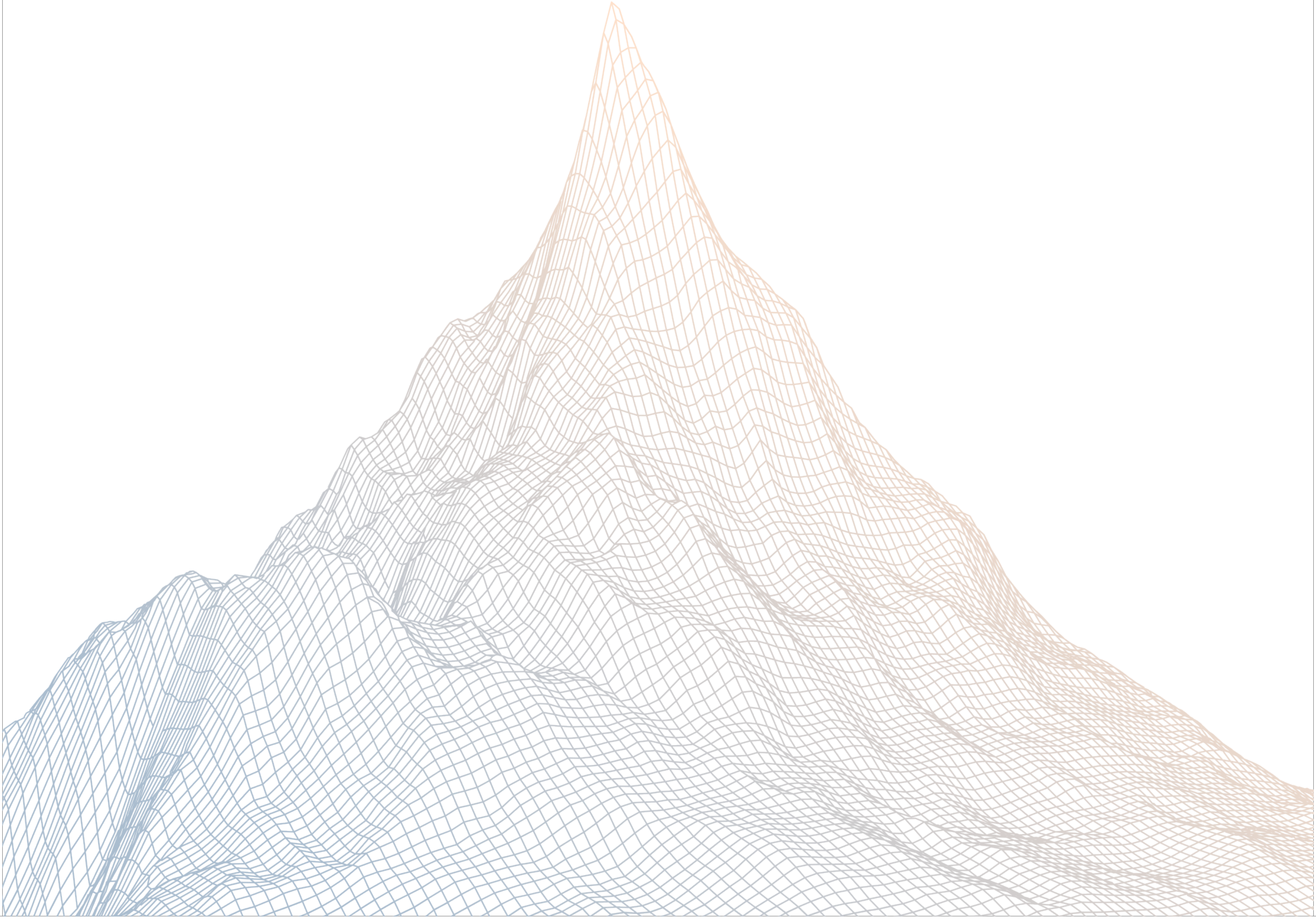
Zenith

Swell

Bytecode & Storage Contents Verification

VERSION 1.1



AUDIT DATES: April 7th to April 8th, 2025

AUDITED BY: SpicyMeatball

Contents

1 Introduction

1.1 About Zenith

Zenith is an offering by Code4rena that provides consultative audits from the very best security researchers in the space. We focus on crafting a tailored security team specifically for the needs of your codebase.

Learn more about us at https://code4rena.com/zenith.

1.2 Disclaimer

This report reflects an analysis conducted within a defined scope and time frame, based on provided materials and documentation. It does not encompass all possible vulnerabilities and should not be considered exhaustive.

The review and accompanying report are presented on an "as-is" and "as-available" basis, without any express or implied warranties.

Furthermore, this report neither endorses any specific project or team nor assures the complete security of the project.

2

Executive Summary

2.1 About Swell

Swell is a non-custodial staking protocol with a mission to deliver the world's best liquid staking and restaking experience, simplify access to DeFi, while securing the future of Ethereum and restaking services.

With Swell, users are able to earn passive income by staking or restaking ETH to earn both blockchain rewards and restaked AVS rewards, and in return be provided with a yield-bearing liquid token (LST or LRT) to hold or participate in the wider DeFi ecosystem to earn additional yield.

2.2 Audit Timeline

April 7th, 2025	Audit start
April 8th, 2025	Audit end
April 10th, 2025	Report published

3 Findings

3.1 Verification Summary

Swellchain is a restaking-focused Layer 2 network built on the OP Stack. It enhances Ethereum's security through EigenLayer restaking, while leveraging OP Stack infrastructure for scalability and transaction processing.

On April 9th, a verification was performed on the on-chain bytecode and storage state of the lido-l2 contracts at blocks:

- Swell: `5745060`
- Base: `28698703`
- Ethereum Mainnet: `22230117`

The objective was to confirm that the contract instances deployed on the Swell mainnet (and their corresponding L1 bridge contracts on Ethereum) are equivalent in bytecode and storage to those deployed on Base. The addresses of the contract instances are the following:

Contract Addresses

Contract	Swell	Base	Ethereum
OptimismBridgeExecutor	0xFF22ea...	0x0E3759...	
ERC20Bridged Proxy	0x7c98E0...	0xc1CBa3...	
ERC20Bridged Impl	0xa1A325...	0x69ce25...	
L2ERC20TokenBridge Proxy	0x831149...	0xac9D11...	
L2ERC20TokenBridge Impl	0x66ca84...	0x7063ef...	
L1ERC20TokenBridge Proxy (Swell)			0xecf337...
L1ERC20TokenBridge Impl (Swell)			0x7e9793...
L1ERC20TokenBridge Proxy (Base)			0x9de443...
L1ERC20TokenBridge Impl (Base)			0x313819...

Conclusions

Bytecode verification confirmed that the logic in the Swell-deployed contracts matches the Base implementation. Differences observed were limited to immutable arguments (e.g., addresses used as parameters).

Minor bytecode discrepancies were also noted due to differing metadata hashes appended at the end of the bytecode. After discussion with the Swell team, we concluded that this was caused by differences in source file paths: the contracts were compiled on a Windows machine where path separators are ` , whereas Unix systems use /‘. As a result, the hashed metadata differs from that of the Base-deployed contracts

Storage verification showed that contents were mostly aligned, with expected differences in implementation and admin addresses. All roles within the contracts were found to be correctly configured.

3.2 Bytecode Verification

OptimismBridgeExecutor

```
Diff between 0xFF22ea467301010F1364fc154c13e0c86Fcfb077 and
    0x0E37599436974a25dDeEdF795C848d30Af46eaCF:
313,314c313,314
 58565b919091019291505056fea2646970667358221220498368ccb3ee1b
 f05894c8a2852d6d4cf24d648ea847bd423530004d57e1bc3e64736f6c63
--
 58565b919091019291505056fea26469706673582212203a6ac9c0481ab3
 d9520b931410e440829aecdacacf855023a51ad521e9fa6dab64736f6c63
```

This difference is located at the very end of the bytecode — in the metadata section. Each contract embeds a 32-byte hex string that corresponds to an IPFS content identifier (CID) for its metadata JSON file. The relevant strings are:

- Swell:
  0x1220498368ccb3ee1bf05894c8a2852d6d4cf24d648ea847bd423530004d57e1bc3e

→ ipfs://QmTHch1Q9BDrud2na45Topjp3siX8YSm475hYX4xFfDWqB

- Base:
  0x12203a6ac9c0481ab3d9520b931410e440829aecdacacf855023a51ad521e9fa6dab

→ ipfs://QmSGgoMEpqucvwr1xvQahdBcXbyKcCYJcLiMfbPGRXMPbY

The root cause of this mismatch appears to be the contract metadata configuration at compile time. Specifically, it stems from a difference in source paths — the Swell contracts were compiled on a Windows machine, which uses ` as a path separator, unlike Unix `systems that use` /‘. This discrepancy alone was enough to cause a difference in the metadata hash

The difference is benign from a verification standpoint, but it's worth noting that all Swell contracts in scope have this issue.

ERC20Bridged Implementation

```
Diff between 0xa1A3257813eD45d91e9c45E03C66FcDD54B4e7c1 and
    0x69ce2505ce515c0203160450157366f927243309:
22c22
 008311496799b8c2c7f13bc32c123ac4eea068e6f081565b60405173ffff
--
 00ac9d11cd4d7ef6e54f14643a393f68ca014287ab81565b60405173ffff
36c36
 0000000008311496799b8c2c7f13bc32c123ac4eea068e6f0161461046857
--
 00000000ac9d11cd4d7ef6e54f14643a393f68ca014287ab161461046857
40c40
 000000000008311496799b8c2c7f13bc32c123ac4eea068e6f016146104e1
--
 0000000000ac9d11cd4d7ef6e54f14643a393f68ca014287ab16146104e1
134,135c134,135
 3e565b50039056fea2646970667358221220037b04dc7012a949210c4dac8
 78c02d57c81d84377e2555f8fa024b6ce144841b64736f6c634300080a00
--
 3e565b50039056fea26469706673582212203cf7a7195c4e1da47689e3c0
 364bd185b2e60637d8444ccc7d885c6f00b3fae064736f6c634300080a00
```

From the bytecode diff, we can confirm that the only functional difference between the two implementations lies in the bridge address, which is set as an immutable variable during contract construction. Specifically:

- Swell's implementation uses 0x8311496799B8C2C7f13bC32c123ac4Eea068e6F0 as the bridge address — this corresponds to Swell's L2ERC20TokenBridge proxy contract.
- Base's implementation uses 0xac9D11cD4D7eF6e54F14643a393F68Ca014287AB, which is the corresponding L2ERC20TokenBridge proxy contract on the Base network.

This confirms that apart from the bridge address (an expected difference), the contract logic remains equivalent.

ERC20Bridged Proxy

```
Diff between 0x7c98E0779EB5924b3ba8cE3B17648539ed5b0Ecc and
    0xc1CBa3fCea344f92D9239c08C0568f6F2F0ee452:
109,110c109,110
 696c6564a2646970667358221220e635bbc464798c0ec3f26b1ebce34042
 31fa728e10a3a781abbe24c0e0b4218764736f6c634300080a0033
--
 696c6564a26469706673582212208f2fec4f0ed674dc02947c8e366d20e3
 e0eb866402388212c7b999a9a07885d364736f6c634300080a0033
```

Metadata hash inconsistency.

L2ERC20TokenBridge Implementation

```
Diff between 0x66ca84bC3C2dB33b6bd7B8994C033444C72b8ADE and
    0x7063ef4f2887586e96096d3e94c9b6961c50a9a2:
21c21
 00ecf3376512edaca4fbb63d2c67d12a0397d2412181565b60405173ffff
--
 009de443adc5a411e83f1878ef24c3f52c61571e7281565b60405173ffff
26c26
 00000000000000007c98e0779eb5924b3ba8ce3b17648539ed5b0ecc8156
--
 0000000000000000c1cba3fcea344f92d9239c08c0568f6f2f0ee4528156
53c53
 007c98e0779eb5924b3ba8ce3b17648539ed5b0ecc73ffffffffffffffff
--
 00c1cba3fcea344f92d9239c08c0568f6f2f0ee45273ffffffffffffffff
80,81c80,81
 5180910390fd5b867f0000000000000000000000007c98e0779eb5924b3b
 a8ce3b17648539ed5b0ecc73ffffffffffffffffffffffffffffffffffff
--
 5180910390fd5b867f000000000000000000000000c1cba3fcea344f92d9
 239c08c0568f6f2f0ee45273ffffffffffffffffffffffffffffffffffff
85c85
 00000000ecf3376512edaca4fbb63d2c67d12a0397d241213373ffffffff
--
 000000009de443adc5a411e83f1878ef24c3f52c61571e723373ffffffff
110,111c110,111
 90fd5b857f0000000000000000000000007c98e0779eb5924b3ba8ce3b17
 648539ed5b0ecc73ffffffffffffffffffffffffffffffffffffffff1681
```

```
--
 90fd5b857f000000000000000000000000c1cba3fcea344f92d9239c08c0
 568f6f2f0ee45273ffffffffffffffffffffffffffffffffffffffff1681
160,161c160,161
 04830152602482018690527f0000000000000000000000007c98e0779eb5
 924b3ba8ce3b17648539ed5b0ecc16906374f4f54790604401600060405l
--
 04830152602482018690527f000000000000000000000000c1cba3fcea34
 4f92d9239c08c0568f6f2f0ee45216906374f4f547906044016000604051
165,166c165,166
 00000000000000000000007c98e0779eb5924b3ba8ce3b17648539ed5b0e
 cc898989888860405160240161137097969594939291906l1cc2565b6040
--
 0000000000000000000000c1cba3fcea344f92d9239c08c0568f6f2f0ee4
 52898989888860405160240161137097969594939291906l1cc2565b6040
171,174c171,174
 909152905061141a7f000000000000000000000000ecf3376512edaca4fb
 b63d2c67d12a0397d241218583611676565b8673ffffffffffffffffffff
 ffffffffffffffffffff167f0000000000000000000000007c98e0779eb5
 924b3ba8ce3b17648539ed5b0ecc73ffffffffffffffffffffffffffffff
--
 909152905061141a7f0000000000000000000000009de443adc5a411e83f
 1878ef24c3f52c61571e72858361167 6565b8673ffffffffffffffffffff
 ffffffffffffffffffff167f000000000000000000000000c1cba3fcea34
 4f92d9239c08c0568f6f2f0ee45273ffffffffffffffffffffffffffffff
270,271c270,271
 ff019056fea2646970667358221220000b63e15872596dbc045bc55a62265
 ea0d98fc51685c7fe8a15de0b8ffdd8ca464736f6c634300080a0033
--
 ff019056fea264697066735822122006d065a0824683b4fdcd6ceb8613fe3
 03c31f956e48f2eaded83309c2668c345a64736f6c634300080a0033
```

Based on the length and structure of the hex nibble differences, we can infer that they correspond to different immutable constructor parameters:

1. First diff — This relates to the `l1TokenBridge_` constructor parameter:

- For Swell, the value corresponds to address 0xEcF3376512EdAca4fBB63d2c67d12A0397D24121 — the L1ERC20TokenBridge contract on Swell.
- For Base, the value corresponds to address 0x9dE443AdC5A411e83F1878EF24C3F52C61571e72 — the L1ERC20TokenBridge on Base.

2. Second diff — This maps to the `l2Token_` constructor parameter:

- For Swell, it resolves to 0x7C98e0779Eb5924B3bA8Ce3B17648539Ed5b0eCc — the ERC20Bridged proxy contract on Swell.
- For Base, it points to 0xC1CBA3fCEa344f92d9239C08c0568F6F2F0eE452 — the ERC20Bridged proxy on Base.

These differences are expected and stem from network-specific deployment addresses being passed as immutables during construction.

L2ERC20TokenBridge Proxy

```
Diff between 0x8311496799B8C2C7f13bC32c123ac4Eea068e6F0 and
    0xac9D11cD4D7eF6e54F14643a393F68Ca014287AB:
109,110c109,110
 696c6564a2646970667358221220e635bbc464798c0ec3f26b1ebce34042
 31fa728e10a3a781abbe24c0e0b4218764736f6c634300080a0033
--
 696c6564a26469706673582212208f2fec4f0ed674dc02947c8e366d20e3
 e0eb866402388212c7b999a9a07885d364736f6c634300080a0033
```

Metadata hash inconsistency.

L1ERC20TokenBridge Implementation

```
Diff between 0x7e97935FbDF2a27EA35c4fdDdaCf5ACd685e65A2 and
    0x313819736457910aC1Dd21a712a37f3d7595645A:
21,22c21,22
 60ff166101c6565b6102857f000000000000000000000000e6a99ef12995
 defc5ff47ec0e13252f0e690375981565b60405173ffffffffffffffffff
--
 60ff166101c6565b6102857f000000000000000000000000866e82a600a1
 414e583f7f13623f1ac5d58b0afa81565b60405173ffffffffffffffffff
24c24
 000000000000000000007c98e0779eb5924b3ba8ce3b17648539ed5b0ecc
--
 00000000000000000000c1cba3fcea344f92d9239c08c0568f6f2f0ee452
32,33c32,33
 2303b685683908857c81565b6102857f0000000000000000000000008311
 496799b8c2c7f13bc32c123ac4eea068e6f081565b6101c66103e1366004
--
 2303b685683908857c81565b6102857f000000000000000000000000ac9d
 11cd4d7ef6e54f14643a393f68ca014287ab81565b6101c66103e1366004
63,64c63,64
 0390fd5b857f0000000000000000000000007c98e0779eb5924b3ba8ce3b
 17648539ed5b0ecc73ffffffffffffffffffffffffffffffffffffffff16
--
 0390fd5b857f000000000000000000000000c1cba3fcea344f92d9239c08
 c0568f6f2f0ee45273ffffffffffffffffffffffffffffffffffffffff16
89,90c89,90
 5180910390fd5b877f0000000000000000000000007c98e0779eb5924b3b
 a8ce3b17648539ed5b0ecc73ffffffffffffffffffffffffffffffffffff
--
 5180910390fd5b877f000000000000000000000000c1cba3fcea344f92d9
 239c08c0568f6f2f0ee45273ffffffffffffffffffffffffffffffffffff
102,103c102,103
 405180910390fd5b867f0000000000000000000000007c98e0779eb5924b
 3ba8ce3b17648539ed5b0ecc73ffffffffffffffffffffffffffffffffff
--
 405180910390fd5b867f000000000000000000000000c1cba3fcea344f92
 d9239c08c0568f6f2f0ee45273ffffffffffffffffffffffffffffffffff
107c107
 00000000008311496799b8c2c7f13bc32c123ac4eea068e6f03373ffffff
--
 0000000000ac9d11cd4d7ef6e54f14643a393f68ca014287ab3373ffffff
109c109
 e6a99ef12995defc5ff47ec0e13252f0e69037591614610cf2576040517f
--
 866e82a600a1414e583f7f13623f1ac5d58b0afa1614610cf2576040517f
112,113c112,113
 ffffffffffffffff167f000000000000000000000000e6a99ef12995defc
 5ff47ec0e13252f0e690375973ffffffffffffffffffffffffffffffffff
--
 ffffffffffffffff167f000000000000000000000000866e82a600a1414e
 583f7f13623f1ac5d58b0afa73ffffffffffffffffffffffffffffffffff
178c178
 0000000000007c98e0779eb5924b3ba8ce3b17648539ed5b0ecc89898988
--
 000000000000c1cba3fcea344f92d9239c08c0568f6f2f0ee45289898988
184,187c184,187
 61159b7f0000000000000000000000008311496799b8c2c7f13bc32c123a
 c4eea068e6f08583611878565b8673ffffffffffffffffffffffffffffff
 ffffffffff167f0000000000000000000000007c98e0779eb5924b3ba8ce
 3b17648539ed5b0ecc73ffffffffffffffffffffffffffffffffffffffff
--
```

```
 61159b7f000000000000000000000000ac9d11cd4d7ef6e54f14643a393f
 68ca014287ab8583611878565b8673ffffffffffffffffffffffffffffff
 ffffffffff167f000000000000000000000000c1cba3fcea344f92d9239c
 08c0568f6f2f0ee45273ffffffffffffffffffffffffffffffffffffffff
212c212
 0000000000000000e6a99ef12995defc5ff47ec0e13252f0e69037591690
--
 0000000000000000866e82a600a1414e583f7f13623f1ac5d58b0afa1690
316,317c316,317
 12200019dd052e5dfcd526d33a4dbcf416f5cd685b24123d882e74cd36e5
 174c1cb664736f6c634300080a0033
--
 1220f6da10712f422a4835b6e2532f706defd2352b3220eecf9e1fce9c51
 4f01ab6c64736f6c634300080a0033
```

Due to the length of the hex nibble differences in the bytecode, we can infer that these variations correspond to distinct immutable constructor parameters:

1. Messenger Address — The first difference aligns with the `messenger` constructor parameter:

- On Swell, this is set to 0xe6A99eF12995DeFc5Ff47EC0E13252f0e6903759.
- On Base, it is 0x866E82A600A1414e583f7F13623F1aC5D58b0AfA.

2. ERC20Bridged Proxy — The second difference pertains to the `l2Token_` parameter:

- On Swell, this is 0x7C98e0779Eb5924B3bA8Ce3B17648539Ed5b0eCc.
- On Base, it is 0xC1CBA3fCEa344f92D9239C08C0568F6F2F0eE452.

3. L2 Token Bridge — The third difference refers to the `l2TokenBridge_` constructor parameter:

- On Swell, this is 0x8311496799B8C2C7f13bC32c123ac4Eea068e6F0 (L2ERC20TokenBridge Proxy).
- On Base, it is 0xac9D11cD4D7eF6e54F14643a393F68Ca014287AB (also an L2ERC20TokenBridge Proxy).

As with the ERC20Bridged contract, these differences are expected and stem from network-specific deployment addresses passed as constructor arguments.

L1ERC20TokenBridge Proxy

```
Diff between 0xecf3376512EDAcA4FBB63d2c67d12a0397d24121 and
    0x9de443AdC5A411E83F1878Ef24C3F52C61571e72:
109,110c109,110
 696c6564a264697066735822122e635bbc464798c0ec3f26b1ebce34042
 31fa728e10a3a781abbe24c0e0b4218764736f6c634300080a0033
--
 696c6564a2646970667358221220 8f2fec4f0ed674dc02947c8e366d20e3
 e0eb866402388212c7b999a9a07885d364736f6c634300080a0033
```

Metadata hash inconsistency.

3.3 Storage Layout Report

OptimismBridgeExecutor

```
slot 0x0 (delay):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x1 (gracePeriod):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000015180
  Base: 0x0000000000000000000000000000000000000000000000000000000000015180
  MATCH
-----------------------------
slot 0x2 (minimumDelay):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x3 (maximumDelay):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000001
  Base: 0x0000000000000000000000000000000000000000000000000000000000000001
  MATCH
-----------------------------
slot 0x4 (guardian):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x5 (actionsSetCounter):
  Swell:  0x0000000000000000000000000000000000000000000000000000000000000000
  Base:  0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x6 (actionsSets):
  Swell:  0x0000000000000000000000000000000000000000000000000000000000000000
  Base:  0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x7 (queuedActions):
  Swell:  0x0000000000000000000000000000000000000000000000000000000000000000
  Base:  0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x8 (ethereumGovernanceExecutor):
  Swell:  0x0000000000000000000000003e40d73eb977dc6a537af587d48316fee66e9c8c
  Base:  0x0000000000000000000000003e40d73eb977dc6a537af587d48316fee66e9c8c
  MATCH
-----------------------------
```

No mismatch was found between the storage layouts of the OptimismBridgeExecutor contract instance in the Swell and Base networks. Notably, the address 0x3e40d73eb977dc6a537af587d48316fee66e9c8c corresponds to the Lido DAO Agent on Ethereum mainnet, which is shared by both the Swell and Base network implementations.

ERC20Bridged Implementation

```
slot 0x0 (totalSupply):
  Swell:  0x0000000000000000000000000000000000000000000000000000000000000000
  Base:  0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x1 (balanceOf):
  Swell:  0x0000000000000000000000000000000000000000000000000000000000000000
  Base:  0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x2 (allowance):
  Swell:  0x0000000000000000000000000000000000000000000000000000000000000000
  Base:  0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
```

Conclusion: Perfect match.

ERC20Bridged Proxy

```
slot 0x0 (totalSupply):
  Swell: 0x00000000000000000000000000000000000000000000001245acbd7d24898569
  Base: 0x0000000000000000000000000000000000000000000009ed59a6a5e7874c898f
  MISMATCH
------------------------------
slot 0x1 (balanceOf):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
------------------------------
slot 0x2 (allowance):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
------------------------------
slot 0xad3228b676f7d3cd4284a5443f17f1962b36e491b30a40b2405849e597ba5fb5
    (default admin):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
------------------------------
slot 0x4910fdfa16fed3260ed0e7147f7cc6da11a60208b5b9406d12a635614ffd9143
    (rollback):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
------------------------------
slot 0x360894a13ba1a3210667c828492db98dca3e2076cc3735a920a3ca505d382bbc
    (implementation):
  Swell: 0x000000000000000000000000a1a3257813ed45d91e9c45e03c66fcdd54b4e7c1
  Base: 0x00000000000000000000000069ce2505ce515c0203160450157366f927243309
  MISMATCH
------------------------------
slot 0xb53127684a568b3173ae13b9f8a6016e243e63b6e8ee1178d6a717850b5d6103
    (admin):
  Swell: 0x000000000000000000000000ff22ea467301010f1364fc154c13e0c86fcfb077
  Base: 0x0000000000000000000000000e37599436974a25ddeedf795c848d30af46eacf
  MISMATCH
------------------------------
slot 0xa3f0ad74e5423aebfd80d3ef4346578335a9a72aeaee59ff6cb3582b35133d50
    (beacon):
```

```
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
```

The following mismatches were found:

- `totalSupply` slot differs between the Swell and Base networks. This mismatch is expected, as both implementations represent actively used contracts.
- `implementation` slot is set to 0xa1a3257813ed45d91e9c45e03c66fcdd54b4e7c1 on Swell, and 0x69ce2505ce515c0203160450157366f927243309 on Base. This is also expected, as each proxy contract points to its respective implementation.
- `admin` slot is set to 0xff22ea467301010f1364fc154c13e0c86fcfb077 on Swell and 0x0e37599436974a25ddeedf795c848d30af46eacf on Base. This mismatch is expected as well, since each network uses a different OptimismBridgeExecutor contract as admin.

L2ERC20TokenBridge Implementation

```
slot 0x0 (roles):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x013e929b381f2fbbac854bd18fb8231dc73c4a2eab0d4cbb4db9436b6ff9b2ba
    (state):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000001
  Base: 0x0000000000000000000000000000000000000000000000000000000000000001
  MATCH
-----------------------------
```

Conclusion: Perfect match.

L2ERC20TokenBridge Proxy

```
slot 0x0 (roles):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x013e929b381f2fbbac854bd18fb8231dc73c4a2eab0d4cbb4db9436b6ff9b2ba
    (state):
```

```
  Swell: 0x0000000000000000000000000000000000000000000000000000000000010101
  Base: 0x0000000000000000000000000000000000000000000000000000000000010101
  MATCH
-----------------------------
slot 0xad3228b676f7d3cd4284a5443f17f1962b36e491b30a40b2405849e597ba5fb5
    (default admin):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x4910fdfa16fed3260ed0e7147f7cc6da11a60208b5b9406d12a635614ffd9143
    (rollback):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
slot 0x360894a13ba1a3210667c828492db98dca3e2076cc3735a920a3ca505d382bbc
    (implementation):
  Swell: 0x00000000000000000000000066ca84bc3c2db33b6bd7b8994c033444c72b8ade
  Base: 0x0000000000000000000000007063ef4f2887586e96096d3e94c9b6961c50a9a2
  MISMATCH
-----------------------------
slot 0xb53127684a568b3173ae13b9f8a6016e243e63b6e8ee1178d6a717850b5d6103
    (admin):
  Swell: 0x000000000000000000000000ff22ea467301010f1364fc154c13e0c86fcfb077
  Base: 0x0000000000000000000000000e37599436974a25ddeedf795c848d30af46eacf
  MISMATCH
-----------------------------
slot 0xa3f0ad74e5423aebfd80d3ef4346578335a9a72aeaee59ff6cb3582b35133d50
    (beacon):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
```

The following mismatches were found:

- `implementation` slot is set to 0x66ca84bc3c2db33b6bd7b8994c033444c72b8ade on the Swell network and 0x7063ef4f2887586e96096d3e94c9b6961c50a9a2 on the Base network. This difference is expected, as each proxy contract references its own dedicated implementation contract.
- `admin` slot is set to 0xff22ea467301010f1364fc154c13e0c86fcfb077 on the Swell network and 0x0e37599436974a25ddeedf795c848d30af46eacf on the Base network. This difference is also expected, as each proxy uses a distinct OptimismBridgeExecutor contract as admin. These contracts have previously been shown to be functionally equivalent.

L1ERC20TokenBridge Implementation

```
slot 0x0 (roles):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
------------------------------
slot 0x013e929b381f2fbbac854bd18fb8231dc73c4a2eab0d4cbb4db9436b6ff9b2ba
    (state):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000001
  Base: 0x0000000000000000000000000000000000000000000000000000000000000001
  MATCH
------------------------------
```

Conclusion: Perfect match.

L1ERC20TokenBridge Proxy

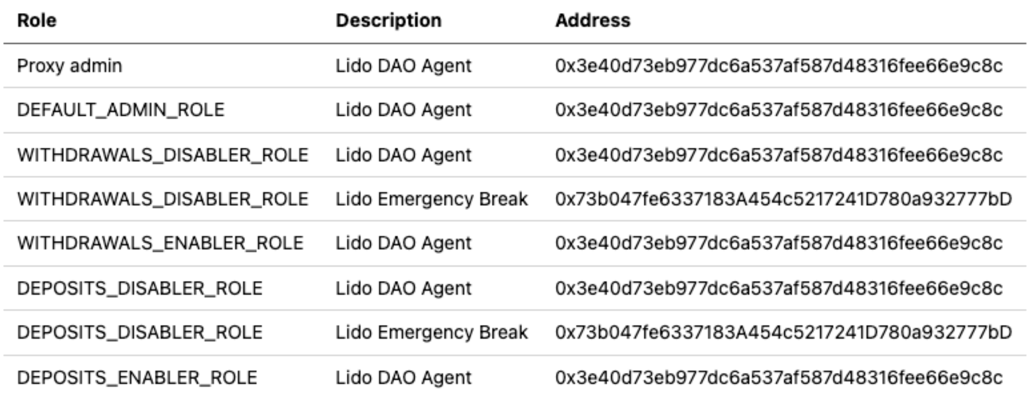
```
slot 0x0 (roles):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
------------------------------
slot 0x013e929b381f2fbbac854bd18fb8231dc73c4a2eab0d4cbb4db9436b6ff9b2ba
    (state):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000010101
  Base: 0x0000000000000000000000000000000000000000000000000000000000010101
  MATCH
------------------------------
slot 0xad3228b676f7d3cd4284a5443f17f1962b36e491b30a40b2405849e597ba5fb5
    (default admin):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
------------------------------
slot 0x4910fdfa16fed3260ed0e7147f7cc6da11a60208b5b9406d12a635614ffd9143
    (rollback):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
------------------------------
slot 0x360894a13ba1a3210667c828492db98dca3e2076cc3735a920a3ca505d382bbc
    (implementation):
  Swell: 0x0000000000000000000000007e97935fbdf2a27ea35c4fdddacf5acd685e65a2
  Base: 0x000000000000000000000000313819736457910ac1dd21a712a37f3d7595645a
  MISMATCH
-----------------------------
slot 0xb53127684a568b3173ae13b9f8a6016e243e63b6e8ee1178d6a717850b5d6103
    (admin):
  Swell: 0x0000000000000000000000003e40d73eb977dc6a537af587d48316fee66e9c8c
  Base: 0x0000000000000000000000003e40d73eb977dc6a537af587d48316fee66e9c8c
  MATCH
-----------------------------
slot 0xa3f0ad74e5423aebfd80d3ef4346578335a9a72aeaee59ff6cb3582b35133d50
    (beacon):
  Swell: 0x0000000000000000000000000000000000000000000000000000000000000000
  Base: 0x0000000000000000000000000000000000000000000000000000000000000000
  MATCH
-----------------------------
```

The only mismatch found corresponds to the `implementation` slot, which is set to 0x7e97935fbdf2a27ea35c4fdddacf5acd685e65a2 for the Swell implementation and 0x313819736457910ac1dd21a712a37f3d7595645a for the Base implementation, both on the Ethereum mainnet. This mismatch is expected, as these proxy contracts each reference their own implementation contracts.

Therefore, logic-wise, the storage layout of the L1ERC20TokenBridge proxy contract instance is identical across both networks. Note that address 0x3e40d73eb977dc6a537af587d48316fee66e9c8c corresponds to the Lido DAO Agent address on the Ethereum mainnet, which is shared between both the Swell and Base network implementations.

3.4 Roles and Permissions

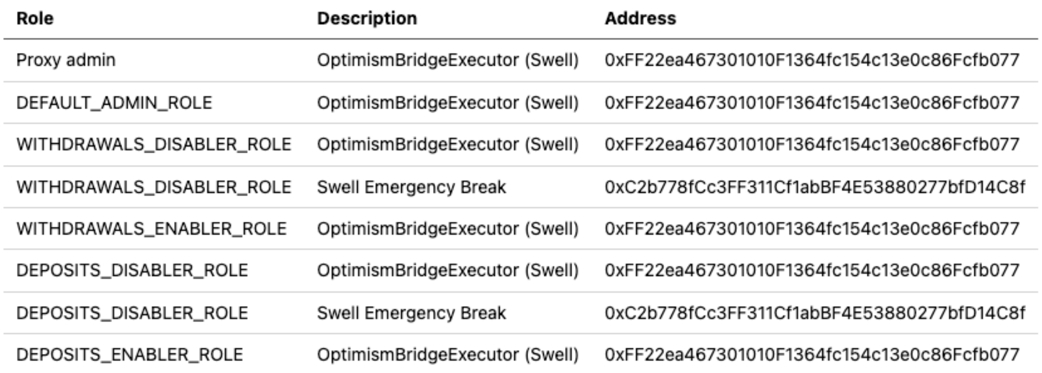
L1ERC20TokenBridge Proxy



Role	Description	Address
Proxy admin	Lido DAO Agent	0x3e40d73eb977dc6a537af587d48316fee66e9c8c
DEFAULT_ADMIN_ROLE	Lido DAO Agent	0x3e40d73eb977dc6a537af587d48316fee66e9c8c
WITHDRAWALS_DISABLER_ROLE	Lido DAO Agent	0x3e40d73eb977dc6a537af587d48316fee66e9c8c
WITHDRAWALS_DISABLER_ROLE	Lido Emergency Break	0x73b047fe6337183A454c5217241D780a932777bD
WITHDRAWALS_ENABLER_ROLE	Lido DAO Agent	0x3e40d73eb977dc6a537af587d48316fee66e9c8c
DEPOSITS_DISABLER_ROLE	Lido DAO Agent	0x3e40d73eb977dc6a537af587d48316fee66e9c8c
DEPOSITS_DISABLER_ROLE	Lido Emergency Break	0x73b047fe6337183A454c5217241D780a932777bD
DEPOSITS_ENABLER_ROLE	Lido DAO Agent	0x3e40d73eb977dc6a537af587d48316fee66e9c8c

Each role was queried for its respective admin candidates, and they were found to match the described specifications.

L2ERC20TokenBridge Proxy



Role	Description	Address
Proxy admin	OptimismBridgeExecutor (Swell)	0xFF22ea467301010F1364fc154c13e0c86Fcfb077
DEFAULT_ADMIN_ROLE	OptimismBridgeExecutor (Swell)	0xFF22ea467301010F1364fc154c13e0c86Fcfb077
WITHDRAWALS_DISABLER_ROLE	OptimismBridgeExecutor (Swell)	0xFF22ea467301010F1364fc154c13e0c86Fcfb077
WITHDRAWALS_DISABLER_ROLE	Swell Emergency Break	0xC2b778fCc3FF311Cf1abBF4E53880277bfD14C8f
WITHDRAWALS_ENABLER_ROLE	OptimismBridgeExecutor (Swell)	0xFF22ea467301010F1364fc154c13e0c86Fcfb077
DEPOSITS_DISABLER_ROLE	OptimismBridgeExecutor (Swell)	0xFF22ea467301010F1364fc154c13e0c86Fcfb077
DEPOSITS_DISABLER_ROLE	Swell Emergency Break	0xC2b778fCc3FF311Cf1abBF4E53880277bfD14C8f
DEPOSITS_ENABLER_ROLE	OptimismBridgeExecutor (Swell)	0xFF22ea467301010F1364fc154c13e0c86Fcfb077

Each role was queried for its respective admin candidates, and they were found to match the described specifications.

3.5 Appendix

Bytecode comparison script

```
#!/bin/bash

# Define contracts and RPC URLs
contracts=("" "")
rpc_urls=("" "")

# File to store results
bytecode_results_file="bytecode_results.txt"
bytecode_diff_file="bytecode_diff.txt"

# Clear or create output files
> "$bytecode_results_file"
> "$bytecode_diff_file"

# Function to format bytecode in 60-char lines
transform_bytecode() {
  fold -w 60
}

# Store bytecodes in memory
declare -A bytecodes

# Fetch and store bytecodes
for i in "${!contracts[@]}"; do
  echo "Fetching bytecode for ${contracts[$i]}..."
  raw=$(cast code "${contracts[$i]}" --rpc-url "${rpc_urls[$i]}")
  formatted=$(echo "$raw" | transform_bytecode)
  bytecodes["${contracts[$i]}"]="$formatted"

  {
    echo "${contracts[$i]} bytecode:"
    echo "$formatted"
    echo "------------------------"
  } >> "$bytecode_results_file"
done

# Compare bytecodes
for i in "${!contracts[@]}"; do
  for j in $(seq $((i+1)) $((${#contracts[@]}-1))); do
    name1="${contracts[$i]}"
    name2="${contracts[$j]}"
    echo "Comparing bytecode between $name1 and $name2..."

    diff_output=$(diff <(echo "${bytecodes[$name1]}") <(echo
    "${bytecodes[$name2]}"))

    if [ -n "$diff_output" ]; then
      {
        echo "Diff between $name1 and $name2:"
        echo "$diff_output"
        echo
      } >> "$bytecode_diff_file"
    else
      echo "$name1 and $name2 bytecodes are identical."
    fi
  done
done

echo "Bytecodes saved to $bytecode_results_file"
echo "Diffs (if any) saved to $bytecode_diff_file"
```

Storage comparison script

```
#!/bin/bash

# CONFIGURATION
slots=(
  "0x0"
  "0x1"
  "0x2"
)  # You can customize this array with any slot indexes

contract1=""
rpc1=""
contract2=""
rpc2=""

block1=
block2=

# Output file
output_file="storage_comparison.txt"
echo "" > $output_file  # clear previous output

for slot in "${slots[@]}"; do
```

```
    echo "Checking slot ${slot}"
    val1=$(cast storage "$contract1" "$slot" --rpc-url "$rpc1" --block "$block1")
    sleep 3
    val2=$(cast storage "$contract2" "$slot" --rpc-url "$rpc2" --block "$block2")
    sleep 3

    echo "slot ${slot}:" >> $output_file
    echo "  contract1:  $val1" >> $output_file
    echo "  contract2:  $val2" >> $output_file

    if [ "$val1" = "$val2" ]; then
        echo "  - MATCH" >> $output_file
    else
        echo "  - MISMATCH" >> $output_file
    fi

    echo "------------------------------" >> $output_file
done

echo "Done.  Results saved to $output_file"
```