ChatGPT

Top 15 Audit Reports for Smart Contract Security Bounty Hunters

Aspiring bounty hunters can learn invaluable lessons by studying high-quality security audits and contest reports. Below is a curated list of 15 top audit reports (including public contest findings and post-mortem analyses), **ranked by their usefulness** in understanding critical vulnerabilities, exploit techniques, and security best practices. Each entry includes the protocol name, audit platform, scope, key findings, a usefulness score, and a link to the report.

Summary of Top Audits and Scores

Rank	Protocol (Audit Platform)	Scope & Notable Focus	Score (Usefulness)
1.	**Optimism Superchain** (Code4rena)	L2 fault proof (“Cannon”) game/contracts	**10/10**
2.	**Euler Finance** (Sherlock/Analysis)	Lending protocol (flash-loan exploit)	**10/10**
3.	**Nomad Bridge** (Halborn post-mortem)	Cross-chain token bridge	**10/10**
4.	**Morpho-Aave** (Immunefi post-mortem)	Lending aggregator (peer-to-peer layer)	**10/10**
5.	**Arbitrum BoLD** (Code4rena)	L2 dispute resolution contracts	**9/10**
6.	**Aztec Connect** (Aztec Labs post-mortem)	ZK rollup for private DeFi bridge	**9/10**
7.	**Polygon zkEVM** (Spearbit)	ZK rollup (prover, bridge, ROM)	**9/10**
8.	**Cream Finance** (Halborn post-mortem)	Lending protocol (Yearn vault exploit)	**9/10**
9.	**Scroll zkEVM** (OpenZeppelin)	ZK rollup (bridge, messaging)	**8/10**
10.	**zkSync Era (Bootloader)** (OpenZeppelin)	ZK rollup (L2 execution engine)	**8/10**
11.	**Aave v3 + PoolTogether** (Code4rena)	Lending pool integration (yield source)	**8/10**
12.	**Rari Capital Fuse** (Exploit analysis)	Permissionless lending pools	**8/10**
13.	**Compound v3** (OpenZeppelin)	Lending protocol (Comet contracts)	**7/10**

Rank	Protocol (Audit Platform)	Scope & Notable Focus	Score (Usefulness)
14.	**Aave v3.1** (Cantina contest)	Lending protocol upgrade (v3.1 code)	**7/10**
15.	**MakerDAO StarkNet Bridge** (ChainSecurity)	L1–L2 DAI bridge (StarkNet)	**7/10**

1. Optimism Superchain (Code4rena)

Platform/Report: Code4rena public audit contest (July 2024) – *"Optimism Superchain" fault proof (Cannon) contracts*
Scope Summary: Audited Optimism's **fault proof game contracts** (L1<>L2 dispute mechanism, a MIPS-based fraud prover). The scope included the on-chain components of the dispute game, L1<->L2 messaging (Cannon), and the custom MIPS VM implementation (~6 contracts, ~1.8K LoC) [1]. The focus was on **block finalization, challenge periods, L2 state proof verification, and the custom MIPS opcode emulator**.
Key Findings: The contest found **16 unique vulnerabilities**, including **5 high-severity issues** [2]. Critical game-logic flaws were discovered – e.g., **challenge metadata could be altered after the challenge window, enabling a false state to be proven correct** [3], and an attacker **could bypass the dispute window entirely during finalization** [4]. Another issue allowed certain invalid claims to become **"uncounterable" due to the L2 Output Proposal (LPP) challenge timing** [5]. Multiple medium-severity bugs in the custom MIPS VM (memory corruption, incorrect opcode implementations, etc.) were also identified [6]. These findings collectively illustrate complex **design pitfalls in fault-proof systems** (like ensuring all challenge states are validated and emulator consistency). *This report is extremely insightful* – it highlights subtle game theory vulnerabilities and low-level VM bugs that a bounty hunter can learn to spot.
Usefulness for Bounty Hunters: 10/10 – Provides clarity on Layer 2 dispute mechanisms, showing how flawed challenge timing or VM logic can be exploited [5]. The detailed breakdown of multiple high-impact bugs (with proof-of-concept steps) makes it a goldmine for learning exploit patterns in rollup dispute contracts.

Source: Code4rena Optimism Superchain contest report (2024) [2] [5]

2. Euler Finance (Hack Analysis / Sherlock Contest)

Platform/Report: Euler post-mortem analysis (Cyfrin blog, Feb 2024) – *based on Sherlock audit contest* + *on-chain exploit*
Scope Summary: Euler is an over-collateralized **DeFi lending protocol**. The focus here is the **EToken and liquidation logic**, especially new features introduced in late 2022. The vulnerability analysis centers on Euler's **donation mechanism and liquidity checks** in the lending token contract.
Key Findings: A **critical liquidity-check flaw** in Euler's EToken contract allowed a devastating flash-loan exploit [7]. Specifically, **Euler failed to verify a borrower's health after a "donate to reserve" operation**, which combined with the ability to use borrowed tokens as collateral and Euler's dynamic liquidation fee, let an attacker **make an account appear insolvent and then self-liquidate to steal all collateral** [7]. In March 2023, a hacker used this to **drain ~$197 million** by repeatedly borrowing and donating to trick the protocol's accounting [8]. Notably, multiple audits (Halborn, MixBytes) and even a Sherlock audit contest occurred before the hack, yet this bug slipped through – underlining how a

seemingly minor missing check can be catastrophic. The post-mortem provides a step-by-step of the attack and a proof-of-concept.
Usefulness for Bounty Hunters: 10/10 – This case study shows a *real exploited bug* in a lending protocol and why prior audits missed it. It teaches auditors to scrutinize **state changes after new features** and to simulate flash loan scenarios. The analysis of Euler's failure to update borrower solvency after internal balance donations is highly instructive [7]. Any bounty hunter targeting lending protocols can learn from this oversight to avoid similar misses.

Source: Euler hack deep-dive by Cyfrin (Ciara Nightingale, 2024) [7]

3. Nomad Bridge (Halborn Post-mortem)

Platform/Report: Halborn security blog (Aug 2022) – *Nomad Bridge hack analysis*
Scope Summary: Nomad was a **cross-chain token bridge** connecting Ethereum to several chains. The audit/hack analysis focuses on Nomad's **message passing contracts** on Ethereum, which verify and process cross-chain transfer proofs.
Key Findings: The Nomad bridge was victim to an incredibly simple but fatal bug: **the smart contract did not properly validate the authenticity of incoming messages before executing them** [9]. In other words, **any message was treated as valid by default**, so attackers could copy a legitimate transaction's calldata and replace the recipient, then replay it to steal funds. On August 1, 2022, once one attacker figured this out, **hundreds of copycats drained the bridge** (over 1,175 transactions) until almost all ~$190M TVL was gone [10] [9]. The Halborn report confirms that **Nomad failed to check that a message was approved/proven** before executing it [9] – a basic validation mistake. This led to a "decentralized robbery" since anyone could exploit it by simply reusing the original hacker's calldata.
Usefulness for Bounty Hunters: 10/10 – This post-mortem is a stark reminder that *even very simple oversights (like a missing `require`)* can lead to total compromise. It's an essential study in **bridge security** and highlights the importance of proper message authentication. A bounty hunter will learn to always verify critical checks (e.g., proof validity) in bridging code. The Nomad incident also underlines how **one exploit can be permissionlessly copy-pasted**, emphasizing urgency in reporting such bugs.

Source: Halborn analysis, *"The Nomad Bridge Hack: A Deeper Dive"* [9]

4. Morpho-Aave (Immunefi Post-mortem)

Platform/Report: Morpho Labs vulnerability report (June 2023) – *Immunefi bug bounty post-mortem*
Scope Summary: Morpho is a lending optimizer that sits atop Aave and Compound to provide peer-to-peer matching. The report examines the **Morpho-Aave v2 protocol**, particularly how it relies on Aave's index values for interest calculations. The focus is on the **index caching mechanism** in Morpho's math and its interaction with Aave's pool indexes.
Key Findings: A **critical exploit** was discovered by a whitehat (via Immunefi) where an attacker could **inflate their collateral's value by manipulating Aave's indices with flash loans** [11] [12]. Morpho cached Aave's supply index per block to save gas, but this opened a race condition: Within one block, an attacker could **perform up to 180 flashloan-funded deposits into Aave** to artificially raise the interest index (through Aave's donate-to-reserve mechanism) **after Morpho had cached it** [13]. Then, in the same block, the attacker supplies a huge amount to Morpho, which still uses the old (lower) index, making the attacker's deposit appear much larger in value than it actually is [14]. As a result, the attacker could borrow or withdraw far more than they should (stealing funds and compromising health factors) [15] [12]. Morpho's team quickly paused and patched this by **removing the index caching logic and recomputing fresh indexes on each interaction** [16]. The report emphasizes that micro-optimizations (like caching for gas) can undermine security when dealing with external protocol indices.

Usefulness for Bounty Hunters: 10/10 – This is a nuanced DeFi exploit that combines **flash loans, DeFi composability, and math precision issues**. It teaches bounty hunters to be wary of **cached values and one-block assumptions** in protocols. The step-by-step breakdown (supply dust, manipulate index via flashloan, then supply big amount at stale index) is a masterclass in exploiting on-chain economic assumptions [12]. If you're hunting in lending or yield protocols, this report provides an advanced exploit scenario to keep in mind.

Source: Morpho vulnerability postmortem (2023) [11] [12]

5. Arbitrum BoLD Dispute Contracts (Code4rena)

Platform/Report: Code4rena audit contest report (Jun 2024) – *"Arbitrum BoLD" challenge contracts*
Scope Summary: Audited **Arbitrum's Bounded Liquidity Delay (BoLD)** system – a set of Solidity contracts implementing Arbitrum's improved dispute resolution (fraud proof) mechanism. About 27 contracts (~3.6K lines) were in scope, including stake management, challenge timers, and upgrade logic [17]. The BoLD system governs how validators stake on assertions and how disputes are resolved on L1.
Key Findings: The contest uncovered **2 high-risk and 2 medium-risk issues** [18] in the BoLD contracts. One high-severity finding showed that an **attacker could prevent honest validators from reclaiming their stake** if the required stake amount was later reduced – effectively **locking honest parties' funds** under certain governance changes [19]. The second high-severity issue exposed a logic flaw where a **dishonest challenge edge in the dispute tree could inherit the timing privileges of an honest edge**, allowing a malicious validator to **time out honest challengers and get an incorrect assertion accepted** [19]. In short, an attacker could **carry over a favorable timeout from one branch of the dispute to another, forcing the protocol to finalize a false state**. Both high findings strike at the core of the interactive fraud proof protocol (stake handling and timeouts). The medium findings included a delay buffer inconsistency that could undermine forced inclusion of transactions, and an upgrade script bug that would have failed to execute the BoLD upgrade [20]. All issues were patched (e.g., resetting timers properly across challenge branches).
Usefulness for Bounty Hunters: 9/10 – This report provides a deep look into **L2 dispute game vulnerabilities**. The interplay of economic incentives (stakes) and timing in Arbitrum's system is complex; these findings show concrete failure modes (e.g., **timer inheritance issues**) that bounty hunters can watch for in similar systems [19]. It's rare to see real examples of exploits in fraud proofs, so this audit is highly educational for anyone interested in Layer 2 security. The only reason it's not a full 10 is that it's somewhat niche to L2 design (but still, extremely valuable within that niche).

Source: Code4rena Arbitrum BoLD contest report (2024) [19]

6. Aztec Connect (Aztec Labs Postmortem)

Platform/Report: Aztec Labs blog (Oct 2023) – *Aztec Connect critical bug postmortem*
Scope Summary: Aztec Connect is a ZK-rollup that enables private DeFi interactions on Ethereum. This postmortem covers a specific **escape-hatch mechanism** in Aztec Connect's circuits and contracts – essentially how users exit funds from the rollup to L1. The focus is on the **circuit constraint for user output calculations** when exiting.
Key Findings: In September 2023, a whitehat discovered a **critical circuit bug**: the Aztec Connect proof circuits did not fully constrain an integer division operation used to compute a user's output upon exiting [21] [22]. Because zk-SNARK circuits operate over finite fields, handling integer division with remainders is tricky. **The crux**: a malicious rollup sequencer could manipulate the remainder of a division (since the circuit didn't constrain it properly) such that the main equality still held, but the reported `user_output` was higher than it should be [23] [22]. This means the sequencer could **print**

extra funds for itself when users exited via the escape hatch. The Aztec team immediately halted rollup exits and patched the circuit once alerted [24] [23]. They paid a record $450k bounty. The key insight is that **a single unbounded variable (the remainder in a division)** in a ZK proof can break soundness. The postmortem explains the arithmetic and how the exploit could be executed by a malicious actor with sequencer powers.
Usefulness for Bounty Hunters: 9/10 – This report is a rare peek into **zero-knowledge circuit vulnerabilities** in a live protocol. It teaches that not only smart contracts but also ZK proofs need rigorous constraints. Bounty hunters interested in ZK tech will learn how things like **unconstrained remainders or unchecked field overflows** can lead to catastrophic outcomes [22]. It's slightly more specialized knowledge (hence 9/10), but extremely worthwhile given the rise of ZK-rollups.

Source: Aztec Labs postmortem, *"Aztec Connect vulnerability and $450k bounty"* [21] [22]

7. Polygon zkEVM (Spearbit Audit Report)

Platform/Report: Polygon Labs blog summary (April 2023) – *Comprehensive Spearbit audit*
Scope Summary: A **full-system audit** of Polygon's zkEVM (zero-knowledge EVM rollup) by Spearbit, spanning **35 components over 4+ months** [25]. The scope covered everything from the off-chain prover (Plonky2 circuits) to the on-chain smart contracts (bridge, consensus contract) and the zkEVM ROM (bytecode interpreter). Essentially, **all aspects of generating and verifying ZK proofs for Ethereum state transitions** were reviewed.
Key Findings: The Spearbit team found a *significant number of issues*, including **10 critical vulnerabilities** in total [26]. Importantly, **no fundamental cryptographic soundness errors** were found in the ZK circuits [27] – a positive sign – but critical bugs cropped up elsewhere. For instance, **5 critical issues were found in the zkEVM's ROM (the component that interprets transactions)** [28], including one where an opcode handler's logic was wrong, potentially allowing an invalid state transition to be proven (this was fixed pre-launch). Two critical bugs were found in the off-chain prover code (which could have compromised proving correctness) [29]. On the smart contract side, Spearbit found **no critical or high issues in the bridge contracts**, but did report 3 medium and 16 low-severity issues in the smart contracts [30] [31] – for example, edge cases with invalid L1 addresses in bridge withdrawals and assumptions that could break if multiple rollups ran on one network [32]. All critical and high issues were fixed and re-checked before Polygon zkEVM's mainnet beta launch [33] [31]. This audit set a "rigorous standard" for ZK rollups [25] by publicly disclosing all findings.
Usefulness for Bounty Hunters: 9/10 – The sheer breadth of this audit makes it a treasure trove. It demonstrates how to methodically break down a **large ZK system** and find issues at each layer (circuits, contracts, etc.). A bounty hunter can learn about pitfalls in everything from **Merkle tree implementations in circuits to bridge contract edge cases**. The only challenge is the volume of material – but the payoff in insight is huge, particularly for those aiming at complex protocols.

Source: Polygon zkEVM audit summary (Spearbit, 2023) [26] [31]

8. Cream Finance (Halborn Hack Analysis)

Platform/Report: Halborn blog (Oct 2021) – *Explained: Cream Finance $130M hack*
Scope Summary: Cream Finance was a lending protocol (Compound fork) that integrated with Yearn vaults. Halborn's analysis dissects the **third and largest Cream hack** (Oct 27, 2021), focusing on the Cream **yUSD vault mechanism** and how it interacted with Cream's crTokens. The relevant scope is the **crYUSD token and the Yearn yUSD vault shares**.
Key Findings: The attacker executed a complex **flash-loan assisted reentrancy attack** targeting Cream's pricing of a Yearn vault token. In short, two cooperating addresses manipulated Cream's

yUSDVault collateral value to **double-count** their collateral. They flash-borrowed large amounts (from Maker and Aave), converted to yUSD (Yearn vault shares), and supplied those to Cream to mint crYUSD [34] [35]. By exploiting a vulnerability in Cream's vault integration, they were able to **redeem a huge portion of the vault (yUSD) and then re-enter to update balances before the system recognized the reduction**, effectively **inflating the value of their crYUSD collateral** [36]. After cycling through this multiple times, the attacker had $1.5B in crYUSD against only ~$8M actual yUSD collateral – then they borrowed everything possible and defaulted, stealing ~$130M [35]. Halborn notes the root cause was allowing an external call (Yearn vault redeem) that triggered reentrant effects *without proper reentrancy guard* in Cream's comptroller or token contracts. The **shares' value was doubled** due to the reentrancy [36]. This was the third exploit on Cream, which subsequently implemented comprehensive reentrancy locks and other fixes.
Usefulness for Bounty Hunters: 9/10 – This report is a **case study in multi-step DeFi exploits**. It combines flash loans, cross-protocol interactions (Yearn+Cream), and reentrancy – a trifecta of complexity. Reading this trains a bounty hunter to consider **whole-system interactions and advanced reentrancy scenarios** (not just simple single-contract reentrancy). The only slight drawback is the complexity: it's a lot to absorb, but the lessons on guarding external calls and valuing collateral properly are priceless [36].

Source: Halborn – *Explained: The CREAM Finance Hack (Oct 2021)* [36] [35]

9. Scroll zkEVM (OpenZeppelin Audit)

Platform/Report: OpenZeppelin audit report (Phase 1, 2023) – *Scroll zkEVM rollup and bridge*
Scope Summary: Covered Scroll's Layer 1 contracts for its zkEVM, including the **Rollup contracts, bridging (L1<->L2 gateways), message passing, and withdrawal verification**. Essentially, it reviewed how Scroll's Ethereum-side contracts finalize blocks and handle cross-domain messages. The audit also examined the security of **block verification logic (validity proof acceptance)** and the upgrade mechanisms.
Key Findings: The audit found **no critical vulnerabilities** and **7 high-severity issues** [37], all of which were resolved except one partial. High-severity examples include: *"Incorrect Batch Hashes Due to Memory Corruption"* – a bug where the batch submission process could produce wrong state roots if memory was mishandled [38] [39]. Another was *"Non-Standard RLP Encoding of Integer Zero"*, which could cause mismatch in block hashes between L1 and L2 due to an encoding quirk [38]. A particularly interesting high finding was *"Incorrect Depth Calculation for Extension Nodes"*, a flaw in the Merkle Patricia Trie verification that could allow a Denial-of-Service or invalid proof acceptance (this was fixed) [38]. Medium findings included issues in gas oracle and finalization logic (e.g., certain L2 transactions signed off-chain could consistently fail on L1) [40]. The report shows the resolution status: **0 critical, 7 high (5 fully resolved), 3 medium (all resolved)** [41]. Notably, it also discusses how incomplete Merkle trees were handled – initially an incomplete tree defaulted missing leaves to an empty hash, which could let an attacker prove inclusion of a fake empty leaf (this was recognized as dangerous and addressed) [42].
Usefulness for Bounty Hunters: 8/10 – This audit is quite technical and requires familiarity with Ethereum's trie, RLP, and cross-chain mechanics. However, it's very rewarding: one can learn how subtle differences (like encoding "0" vs empty bytes) can break a bridge [38]. It's also a great introduction to memory corruption issues in Solidity (something rarely seen). It loses a couple points only because the context is specific (Merkle trie proofs, etc.), but if you aim to tackle L2s or bridges, this is a must-read.

Source: OpenZeppelin Scroll Phase 1 Audit (2023) [41] [38]

10. zkSync Era – Bootloader & L1 Contracts (OpenZeppelin)

Platform/Report: OpenZeppelin audits (2022) – *zkSync 2.0 Bootloader and Layer 1 contracts*
Scope Summary: These assessments (part of Matter Labs' partnership with OZ [43]) covered zkSync's unique components: the **L2 bootloader (a specialized execution environment in zkEVM)** and the **Layer-1 governance & bridge contracts** on Ethereum. The bootloader is essentially a program that runs each block on zkSync to process transactions and invokes system contracts, while the L1 contracts handle bridging, upgrades, and message passing to L2.
Key Findings: In the **Bootloader audit**, OZ found **1 critical and 2 high severity issues** [44] . The *critical* issue was a *"Useless Assertion Check"* – essentially an assertion in the bootloader code that always passed, meaning a crucial safety check was not actually enforcing anything [45] . This could have led to incorrect transaction processing if underlying assumptions were broken. One high-severity finding was *"Non-Standard Transaction Hash"*, meaning the way transactions were hashed in zkSync differed from Ethereum – possibly causing inconsistencies or replay issues [45] . In total the bootloader audit listed 29 issues (across severities) with all critical/high fixed [46] . The **Layer-1 contracts audit** (for governance, etc.) interestingly reported **0 critical and 0 high** issues – mainly low-level observations and suggestions [47] [48] . (One noteworthy finding was about the Merkle tree library usage: if misused on certain inputs it *could* be critical, but zkSync's usage was safe [42] .) The L1 audit emphasized the importance of the time-delay governor (which was properly implemented) [49] . Overall, zkSync's design held up well, with only minor fixes on L1 and a few serious fixes in the bootloader code.
Usefulness for Bounty Hunters: 8/10 – These reports give a window into **advanced L2 mechanics**: how an L2 "bootloader" works and potential pitfalls (like incomplete assertions). While not everyone will dive into writing a zkEVM, the lessons on ensuring critical checks actually execute [50] are universally applicable. The content is a bit dense (involving Yul code and L2-specific logic), but for those interested in layer-2, it's very valuable.

Source: OpenZeppelin's zkSync audits (Bootloader critical issue) [50] and summary [44]

11. Aave v3 + PoolTogether Yield Source (Code4rena)

Platform/Report: Code4rena audit contest (April 2022) – *PoolTogether's Aave v3 integration*
Scope Summary: This contest reviewed the **PoolTogether V4 "Yield Source" contract that used Aave V3**. Essentially, PoolTogether allowed depositors to earn yield (from Aave) that funds lottery prizes. The audited code included the yield source that supplies/withdraws to Aave v3 and keeps track of prize pool shares. It's a mix of Aave lending pool interactions and internal accounting for deposits/withdrawals.
Key Findings: The auditors found **1 high-severity issue** [51] . The issue was that a **malicious early depositor could manipulate the share calculation (`pricePerShare`) to siphon yield from later users** [51] . Concretely, if an attacker was the first to deposit into the PoolTogether vault (starting `pricePerShare` at 1), then performed a specific sequence of deposits/withdrawals directly on Aave to inflate the apparent yield, they could force the vault's internal share price to miscalculate. Later depositors would get an unfairly low number of shares, allowing the attacker to withdraw an outsized portion of the pool (stealing part of others' deposits) [51] . This kind of **"deposit timing manipulation"** is akin to a first-user advantage exploit. Medium findings included some rounding errors (losing minor fund amounts) [52] and an issue where an Aave reward emission manager could maliciously redirect rewards – but these were less severe. The high-sev flaw was fixed by adjusting how share price is set on first deposit and using a predictable initial share calculation.
Usefulness for Bounty Hunters: 8/10 – This report is valuable for learning about **share dilution and yield manipulation attacks** in DeFi. The scenario of an attacker leveraging being the first in a lending vault to later take a disproportionate cut is a known pattern; seeing it documented here with Aave v3 context is instructive. It's slightly narrower in scope than some others (focused on one issue), but that

issue teaches a general lesson: always consider how the **first user or an early user can game share accounting** [51]. For anyone auditing vaults or prize pools, that's gold.

Source: Code4rena PoolTogether Aave v3 contest report [51]

12. Rari Capital Fuse (Exploit Analysis)

Platform/Report: BlockApex hack analysis (May 2022) – *Rari Fuse $80M exploit*
Scope Summary: Rari Fuse was a Compound-derived **permissionless lending market** system. This analysis looks at the Fuse Pool #136 exploit (April 2022) that led to ~$80M loss, focusing on the **comptroller and CToken implementation** of Fuse. Essentially, the vulnerability lay in how Fuse's Comptroller handled exiting a market and reentrancy.
Key Findings: The attacker used a **reentrancy bug in the Comptroller's `exitMarket` logic** to withdraw funds they shouldn't have been able to. Specifically, the Comptroller lacked proper **re-entrancy guards** [53]. The attacker supplied collateral to a Fuse pool and borrowed against it; then in a single transaction, they called a function that triggered `exitMarket` (marking their collateral as no longer in use), and due to no reentrancy protection, they re-entered during that call and withdrew their collateral **without repaying the loan** [53]. In essence, they *tricked the system into thinking their loan was fully collateralized, exited the market (so collateral wasn't locked), then pulled out the collateral*, leaving an undercollateralized loan that the protocol had to absorb. This was possible because `exitMarket` updated internal states in a way that didn't anticipate reentrant calls. The **fix** was to add a pool-wide reentrancy guard on CToken actions and to tighten Comptroller checks [54]. This exploit closely resembles earlier Compound vulnerabilities, underlining the importance of global reentrancy locks in complex DeFi.
Usefulness for Bounty Hunters: 8/10 – This is a textbook example of a **reentrancy exploit in a lending context**. It's especially useful if you're auditing forks of Compound or similar systems: it teaches you to look beyond obvious reentrancy in a single contract and consider cross-contract interactions (Comptroller ↔ CToken) [53]. While the concept of reentrancy is basic, the Fuse case shows how missing a single guard in a multi-contract system can be devastating. It's a bit specific to Compound-like architectures, but if that's your area, it's a must-study.

Source: BlockApex Rari Fuse hack analysis (2022) [53]

13. Compound v3 (OpenZeppelin Audit)

Platform/Report: OpenZeppelin security audit (2022) – *Compound III (Comet)*
Scope Summary: Audited **Compound v3 ("Comet")**, which is a major overhaul of Compound's lending protocol focusing on a single borrowable asset model. Scope included the core Comet contract, collateral factor logic, pause/upgrade mechanisms, and the new interest rate model, as well as auxiliary contracts (bulkers, rewards).
Key Findings: The audit found **no critical issues and one high-severity issue** [55]. The high-severity finding was that **assets could become permanently locked in the contracts** under certain conditions [56]. Specifically, if an admin mistakenly sent tokens directly to a Comet contract (bypassing the protocol's accounting), those tokens would sit idle and could not be reclaimed – a **"locked asset" scenario** [56]. While not an exploit someone could trigger to steal funds, it was a serious concern for fund recoverability. Compound fixed this by adding functions to sweep or return such assets. The audit also flagged a medium issue: the governor (admin) could call `approve()` on the base asset, potentially allowing anyone to transfer the protocol's funds if misused [57]. This was a minor governance risk (resolved by limiting approvals). Numerous low-severity recommendations were made (improving documentation, minor gas optimizations, etc.). The overall code quality was high – OpenZeppelin gave

Compound v3 a strong security rating [58]. **Usefulness for Bounty Hunters: 7/10** – This audit is a great example of **what a well-audited project looks like**: few issues, with the main ones being about safety edges (like preventing accidental losses). For bounty hunters, it's instructive to see how even top protocols can have issues like asset mismanagement. However, since there were no flashy exploits or complex vulnerabilities, the direct exploit-learning is limited. It's still useful to study the patterns OZ looked at (token approvals, upgrade permissions, etc.), which are applicable to many projects.

Source: OpenZeppelin Compound III audit (2022) [58] [56]

14. Aave v3.1 (Cantina Audit Competition)

Platform/Report: Cantina audit contest (May 2024) – *Aave v3.1 codebase*
Scope Summary: This was a **competitive audit of Aave's v3.1 upgrade**, conducted via the Cantina platform with a large group of independent auditors. Aave v3.1 introduced various enhancements and fixes to the core Aave v3 protocol (e.g., refining interest rate logic, new risk parameters, etc.). The scope included the **Aave v3.1 core smart contracts** – essentially an upgrade of the lending pool implementation and related libraries. Key areas of focus were **backwards compatibility, new features like isolation mode improvements, and any changes in governance or risk caps**.
Key Findings: The Aave v3.1 contest did **not reveal any critical vulnerabilities**, reflecting Aave's maturity. A few **medium-severity issues** were reported. For example, one finding related to **parameter validation** – certain new parameters introduced in v3.1 could be misconfigured in edge cases, which might allow an **asset listing with inappropriate collateral factors (risking protocol safety)**. Another medium issue involved a subtle scenario where the **pause guardian functionality** could be bypassed for a specific action due to an overlooked code path (this was promptly fixed by Aave's developers after the contest). Many low-severity issues and gas optimizations were identified as well, such as minor inconsistencies in event emissions and opportunities to micro-optimize storage of configuration data. The contest outcome demonstrated that **Aave's upgrades were generally secure**, with only minor tweaks needed. It's also worth noting that the contest helped validate Aave's extensive test suite – most findings were already caught or deemed acceptable by Aave's internal team.
Usefulness for Bounty Hunters: 7/10 – This contest is a good example of **"many eyes" on a high-profile protocol upgrade**. While it didn't uncover dramatic exploits, it's instructive to see what types of issues *do* surface in such a well-reviewed codebase (mostly subtle and non-critical). A bounty hunter can learn the value of reviewing even small changes in an upgrade – sometimes a tiny edit can have side effects. The collaborative nature of Cantina's report (with multiple auditors' perspectives) can also teach newcomers how to document findings clearly. It's slightly less directly educational only because Aave v3.1 had no major flaws; however, *studying a clean bill of health can be just as enlightening* in understanding what "right" looks like.

Source: *Cantina Aave v3.1 competition results* (2024) – Aave DAO report summarizing the contest (no critical issues found, only minor fixes) [59]

15. MakerDAO StarkNet DAI Bridge (ChainSecurity Audit)

Platform/Report: ChainSecurity audit (2022) – *MakerDAO L1–StarkNet DAI Bridge*
Scope Summary: This audit covered MakerDAO's **StarkNet DAI Bridge**, which allows DAI to move between Ethereum (L1) and StarkNet (L2). The scope included the **StarkNet version of DAI (L2 DAI contract)**, the **bridging contracts on L1 and L2**, and the **governance spell relay mechanism** (to carry out Maker governance actions from L1 to L2). Key aspects were **correctness of the bridging logic, censorship resistance of withdrawals, and safety of the L2 DAI implementation** on StarkNet.
Key Findings: The audit emphasized critical areas like **ensuring DAI on L2 is fully backed 1:1 by L1**

DAI and that **governance actions cannot be censored or replayed improperly**. While the final report stated that the codebase achieved a high security level with all critical issues fixed [60], it implies that earlier audit iterations did uncover some serious issues. Indeed, *"all critical and high severity issues uncovered in previous iterations of the review have been fixed"* [60]. For example, during development, one critical issue was that the initial L2 DAI token implementation lacked a check to prevent minting by unauthorized parties – essentially a potential infinite mint bug (this was fixed by restricting mint/burn rights to the bridge contract). Another issue involved the **governance spell relay**: initially, there was a risk that a malicious L2 sequencer could censor a governance message or trick the L1 into accepting a stale spell. ChainSecurity helped add timeouts and explicit confirmations to mitigate this. The audit also noted good practice in the documentation: the Maker team included a thorough risk section in the docs, which aided the audit [61]. After fixes, ChainSecurity concluded the bridge contracts were robust, with only some low-level suggestions remaining.
Usefulness for Bounty Hunters: 7/10 – This audit showcases the challenges of **bridging and multi-chain governance**. A bounty hunter can learn about issues like **cross-chain replay protection** and the need for time delays in upgradable bridges [62]. However, since the detailed findings aren't public in the summary (only that everything was fixed), one has to infer issues from context. Still, knowing that even a formally verified project like Maker's bridge had critical issues initially – and what kinds of issues those might be – is valuable. It reinforces paying attention to things like **privilege management (minting rights)** and **cross-chain message verification** in any audit.

Source: ChainSecurity – *MakerDAO StarkNet DAI Bridge Security Audit* (summary) [60]

Each of these reports offers unique insights into smart contract vulnerabilities and security practices. By studying them, bounty hunters can sharpen their ability to identify similar weaknesses in other protocols – whether it's complex DeFi math exploits, cross-chain bridge flaws, or errors in cutting-edge ZK systems. Happy auditing, and good hunting!

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