



Solana Labs – Runtime v1.14.6 – v1.14.13 L1 Security Audit

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DOCUMENT REVISION HISTORY

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EXECUTIVE OVERVIEW

1.1 INTRODUCTION

Solana is an open-source project implementing a new, high-performance, permissionless blockchain. Changes in scope affected several modules, the most important ones are briefly described. [Sealevel](#), Solana's parallel smart contracts runtime, is a concurrent transaction processor. Transactions specify their data dependencies upfront, and dynamic memory allocation is explicit. By separating program code from the state it operates on, the runtime can choreograph concurrent access. [Gulf Stream](#) the transaction forwarding protocol, which is Solana's mempool-less solution for forwarding and storing transactions before processing them. The [Gossip](#) Service acts as a gateway to nodes in the control plane. Validators use the service to ensure information is available to all other nodes in a cluster. [TPU](#) (Transaction Processing Unit) is the logic of the validator responsible for block production.

[Halborn](#) conducted a security audit on the Solana v1.14.6 to v1.14.13 changes beginning on February 6th, 2023 and ending on February 10th, 2023 . The security assessment was scoped to the implementation of the updates up to v1.14.13 provided in the [solana](#) GitHub repository. Commit hashes and further details can be found in the [Scope](#) section of this report.

1.2 AUDIT SUMMARY

The team at Halborn was provided 1 week for the engagement and assigned 1 full-time security engineer to audit the security of the programs in scope. The security engineer is a blockchain and smart contract security expert with advanced penetration testing and smart contract hacking skills, and deep knowledge of multiple blockchain protocols.

The purpose of this audit is to:

- Identify potential security issues within the programs

In summary, Halborn did not identify any significant security risk affecting the new updates introduced in releases 1.14.6 to 1.14.13 in the `program-runtime`, `runtime` and `bpf_loader` modules in scope. Two informational findings were presented and acknowledged by the Solana team.

1.3 TEST APPROACH & METHODOLOGY

Halborn performed a combination of a manual review of the source code and automated security testing to balance efficiency, timeliness, practicality, and accuracy in regard to the scope of the program audit. While manual testing is recommended to uncover flaws in business logic, processes, and implementation; automated testing techniques help enhance coverage of programs and can quickly identify items that do not follow security best practices.

The following phases and associated tools were used throughout the term of the audit:

- Research into the architecture, purpose, and use of the platform.
- Manual program source code review to identify business logic issues.
- Mapping out possible attack vectors
- Thorough assessment of safety and usage of critical Rust variables and functions in scope that could lead to arithmetic vulnerabilities.
- Finding unsafe Rust code usage (`cargo-geiger`)
- Scanning dependencies for known vulnerabilities (`cargo audit`).
- Local runtime testing (`solana-test-framework`)

RISK METHODOLOGY:

Vulnerabilities or issues observed by Halborn are ranked based on the risk assessment methodology by measuring the **LIKELIHOOD** of a security incident

and the **IMPACT** should an incident occur. This framework works for communicating the characteristics and impacts of technology vulnerabilities. The quantitative model ensures repeatable and accurate measurement while enabling users to see the underlying vulnerability characteristics that were used to generate the Risk scores. For every vulnerability, a risk level will be calculated on a scale of 5 to 1 with 5 being the highest likelihood or impact.

RISK SCALE - LIKELIHOOD

- 5 - Almost certain an incident will occur.
- 4 - High probability of an incident occurring.
- 3 - Potential of a security incident in the long term.
- 2 - Low probability of an incident occurring.
- 1 - Very unlikely issue will cause an incident.

RISK SCALE - IMPACT

- 5 - May cause devastating and unrecoverable impact or loss.
- 4 - May cause a significant level of impact or loss.
- 3 - May cause a partial impact or loss to many.
- 2 - May cause temporary impact or loss.
- 1 - May cause minimal or un-noticeable impact.

The risk level is then calculated using a sum of these two values, creating a value of 10 to 1 with 10 being the highest level of security risk.

CRITICAL	HIGH	MEDIUM	LOW	INFORMATIONAL
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- 10 - CRITICAL
- 9 - 8 - HIGH
- 7 - 6 - MEDIUM
- 5 - 4 - LOW
- 3 - 1 - VERY LOW AND INFORMATIONAL

1.4 SCOPE

Code repositories:

1. Solana

- Repository: `solana`
- Releases v1.14.6-v1.14.13:
 - start: `be4242c5be89e13c920540703ebb30e2704906ea`
 - final: `0a3e52ba8b4f63c3675fa91fc89c4f54f69e5855`
- Modules in scope:
 1. `program-runtime` (`solana/program-runtime/src`)
 2. `runtime` (`solana/runtime/src`)
 3. `bpf_loader` (`solana/programs/bpf_loader/src`)

Out-of-scope:

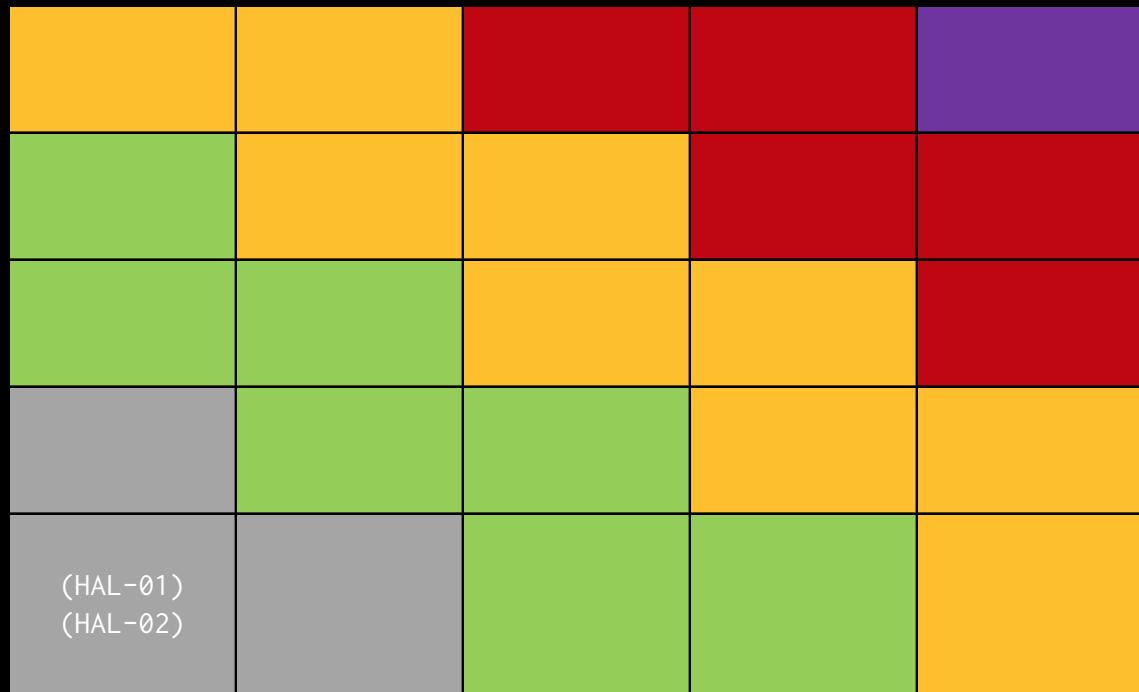
- third-party libraries and dependencies
- financial-related attacks

2. ASSESSMENT SUMMARY & FINDINGS OVERVIEW

CRITICAL	HIGH	MEDIUM	LOW	INFORMATIONAL
0	0	0	0	2

LIKELIHOOD

IMPACT

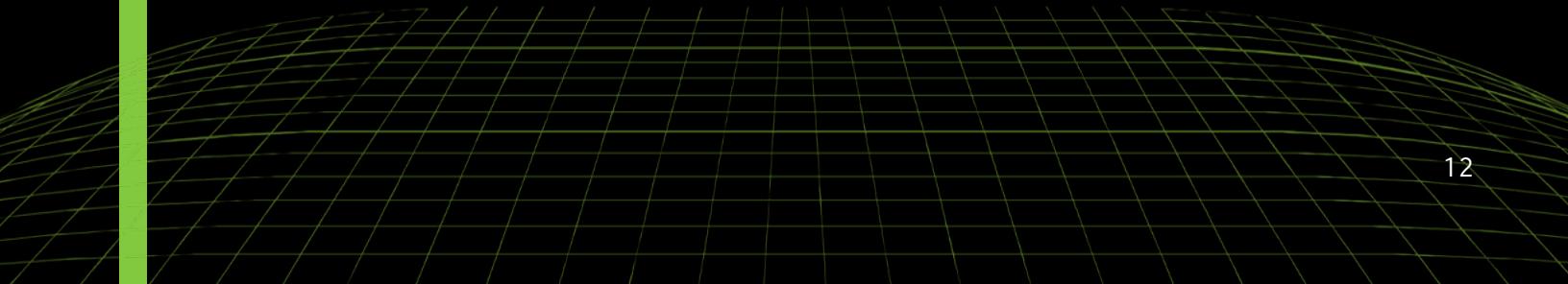


EXECUTIVE OVERVIEW

SECURITY ANALYSIS	RISK LEVEL	REMEDIATION DATE
HAL-01 - POSSIBLE RUST PANICS DUE TO UNSAFE UNWRAP USAGE	Informational	ACKNOWLEDGED
HAL-02 - MISSING CARGO OVERFLOW CHECKS	Informational	ACKNOWLEDGED



FINDINGS & TECH DETAILS



3.1 (HAL-01) POSSIBLE RUST PANICS DUE TO UNSAFE UNWRAP USAGE - INFORMATIONAL

Description:

The use of helper methods in Rust, such as `unwrap`, is allowed in dev and testing environment because those methods are supposed to throw an error (also known as `panic!`) when called on `Option::None` or a `Result` which is not `Ok`. However, keeping `unwrap` functions in the production environment is considered bad practice because they may lead to program crashes, which are usually accompanied by insufficient or misleading error messages.

Code Location:

Note: only `unwraps` introduced by the changes in scope are listed, justified usages such as in tests were excluded.

Listing 1

```
./runtime/src/loader_utils.rs:20      let current_exe = env::  
↳ current_exe().unwrap();  
./runtime/src/loader_utils.rs:21      PathBuf::from(current_exe.  
↳ parent().unwrap().parent().unwrap())  
./runtime/src/loader_utils.rs:30      file.read_to_end(&mut program)  
↳ .unwrap();  
./runtime/src/loader_utils.rs:50          .unwrap(),  
./runtime/src/loader_utils.rs:58          .unwrap();  
./runtime/src/loader_utils.rs:69          .unwrap();  
./runtime/src/loader_utils.rs:87          .unwrap();  
./runtime/src/loader_utils.rs:113         .unwrap(),  
↳           .unwrap(),  
./runtime/src/loader_utils.rs:117           .unwrap(),  
./runtime/src/loader_utils.rs:121           .unwrap();  
./runtime/src/loader_utils.rs:137           .unwrap();  
./runtime/src/loader_utils.rs:174           .unwrap(),  
./runtime/src/loader_utils.rs:178           .unwrap();  
./runtime/src/loader_utils.rs:186           .unwrap();  
./runtime/src/loader_utils.rs:215           .unwrap();
```

```
./runtime/src/loader_utils.rs:235      .unwrap();  
./runtime/src/prioritization_fee_cache.rs:154      .unwrap()  
./runtime/src/prioritization_fee_cache.rs:174  
↳      .unwrap(),  
./runtime/src/prioritization_fee_cache.rs:190      let mut cache  
↳ = cache.write().unwrap();  
./runtime/src/prioritization_fee_cache.rs:219  
↳      .unwrap()  
./runtime/src/prioritization_fee_cache.rs:229      transaction_fee: priority_details  
↳ .unwrap().priority,  
./runtime/src/prioritization_fee_cache.rs:276      measure!()  
↳ block_prioritization_fee.lock().unwrap(), "entry_lock_time");  
./runtime/src/prioritization_fee_cache.rs:296      measure!()  
↳ block_prioritization_fee.lock().unwrap(), "entry_lock_time");  
./runtime/src/prioritization_fee_cache.rs:345      .unwrap()  
./runtime/src/prioritization_fee_cache.rs:347      .filter  
↳ (|(_slot, prioritization_fee)| prioritization_fee.lock().unwrap().  
↳ is_finalized())  
./runtime/src/prioritization_fee_cache.rs:354      .unwrap()  
./runtime/src/prioritization_fee_cache.rs:357  
↳ let prioritization_fee_read = prioritization_fee.lock().unwrap();
```

Risk Level:

Likelihood - 1

Impact - 1

Recommendation:

It is recommended not to use the `unwrap` function in the production environment because its use causes `panic!` and may crash any affected module, program or, in the worst case, the runtime without verbose error messages. Crashing the system will result in a loss of availability and, in some cases, even private information stored in the state. Some alternatives are possible, such as propagating the error with `?` instead of unwrapping, or using the `error-chain` crate for errors.

FINDINGS & TECH DETAILS

Remediation Plan:

ACKNOWLEDGED: The Solana Labs team acknowledged this issue.

3.2 (HAL-02) MISSING CARGO OVERFLOW CHECKS - INFORMATIONAL

Description:

It was observed that there is no `overflow-checks=true` in `Cargo.toml`. By default, overflow checks are disabled in optimized release builds. Hence, if there is an overflow on release builds, it will be silenced, leading to unexpected behavior of an application. Even if checked arithmetic is used through `checked_*` or `saturating_*`, it is recommended to have that check in `Cargo.toml`.

Code Location:

- `program-runtime/Cargo.toml`
- `programs/bpf_loader/Cargo.toml`

Risk Level:

Likelihood - 1

Impact - 1

Recommendation:

It is recommended to add `overflow-checks=true` under your release profile in `Cargo.toml`.

Remediation Plan:

ACKNOWLEDGED: The Solana Labs team acknowledged this issue.

MANUAL TESTING

In the manual testing phase, the following scenarios were simulated. The scenarios listed below were selected based on the severity of the vulnerabilities Halborn was testing the program for.

4.1 MINIMUM DELEGATION FOR STAKE REWARDS

Description:

Commit [fab87b7](#) back ported to v1.14 a feature for filtering out stake accounts from collecting rewards if they have less lamports than the defined minimum stake delegation. Since stake accounts with lower balance are excluded from receiving epoch rewards, it was tested that it was not possible to receive any reward when the stake account's balance did not meet the threshold.

Results:

No code vulnerabilities were identified.

4.2 PRIORITIZATION FEES

Description:

Commit [6c66421](#) back ported to v1.14 a feature for tracking minimum prioritization fees for a transaction in a specific block and a cache for recording the prioritization fees associated with the previous 150 blocks to help to estimate the necessary fee for the current block. Several tests were performed to ensure that prioritization fees were appropriately updated and that edge-cases would not prevent sanitized transactions landing in a block if the prioritization fee is sufficient.

Results:

No code vulnerabilities were identified.

4.3 CONSENSUS

Description:

Commit [979792b](#) fixed a consensus mismatch affecting v1.14, before the patch there was a check for pointer alignment at CPI exit when the account length has changed, this caused an issue when accounts changed, but the size remained equal. `bpf_loader` was modified to prevent unaligned user-provided pointers from causing errors, and the new functionality was added behind a feature set flag. The fix was reviewed to check if the logic could be bypassed since it includes an `unsafe` block due to a raw pointer dereference.

Results:

No code vulnerabilities were identified.

AUTOMATED TESTING

5.1 AUTOMATED ANALYSIS

Description:

Halborn used automated security scanners to assist with the detection of well-known security issues and vulnerabilities. Among the tools used was [cargo-audit](#), a security scanner for vulnerabilities reported to the Rust-Sec Advisory Database. All vulnerabilities published in <https://crates.io> are stored in a repository named The RustSec Advisory Database. cargo audit is a human-readable version of the advisory database which performs a scanning on Cargo.lock. Security Detections are only in scope. All vulnerabilities shown here were already disclosed in the above report. However, to better assist the developers maintaining this code, the auditors are including the output with the dependencies tree, and this is included in the cargo audit output to better know the dependencies affected by unmaintained and vulnerable crates.

Results:

ID	package	Short Description
RUSTSEC-2020-0071	time	Potential segfault in the time crate
RUSTSEC-2023-0001	tokio	Configuration corruption
RUSTSEC-2021-0139	ansi_term	ansi_term is unmaintained
RUSTSEC-2020-0016	net2	net2 crate has been deprecated
RUSTSEC-2021-0127	serde_cbor	serde_cbor is unmaintained

5.2 UNSAFE RUST CODE DETECTION

Description:

Halborn used automated security scanners to assist with the detection of well-known security issues and vulnerabilities. Among the tools used was [cargo-geiger](#), a security tool that lists statistics related to the usage of unsafe Rust code in a core Rust codebase and all its dependencies.

Results:

Symbols:

- 🔒 = No `unsafe` usage found, declares #![forbid(unsafe_code)]
- ❓ = No `unsafe` usage found, missing #![forbid(unsafe_code)]
- ⚠️ = `unsafe` usage found

Functions	Expressions	Impls	Traits	Methods	Dependency
0/0	35/35	0/0	0/0	0/0	solana-runtime 1.14.13
0/0	0/0	0/0	0/0	0/0	arrayref 0.3.6
0/0	22/22	0/0	0/0	0/0	bincode 1.3.3
0/0	5/5	0/0	0/0	0/0	serde 1.0.138
0/0	0/0	0/0	0/0	0/0	serde_derive 1.0.138
0/0	12/12	0/0	0/0	3/3	proc-macro2 1.0.41
0/0	4/4	0/0	0/0	0/0	unicode-ident 1.0.2
0/0	0/0	0/0	0/0	0/0	quote 1.0.18
0/0	12/12	0/0	0/0	3/3	proc-macro2 1.0.41
0/0	50/50	3/3	0/0	2/2	syn 1.0.98
0/0	12/12	0/0	0/0	3/3	proc-macro2 1.0.41
0/0	0/0	0/0	0/0	0/0	quote 1.0.18
0/0	4/4	0/0	0/0	0/0	unicode-ident 1.0.2
2/78	29/3973	0/0	0/0	0/0	blake3 1.3.1
0/0	0/0	0/0	0/0	0/0	arrayref 0.3.6
2/2	350/350	2/2	0/0	7/7	arrayvec 0.7.2
0/0	5/5	0/0	0/0	0/0	serde 1.0.138
0/0	0/0	0/0	0/0	0/0	cfg-if 1.0.0
0/0	0/0	0/0	0/0	0/0	constant_time_eq 0.1.5
0/0	0/0	0/0	0/0	0/0	digest 0.10.3
0/0	16/16	0/0	0/0	0/0	block-buffer 0.10.2
1/1	292/292	20/20	8/8	5/5	generic-array 0.14.5
0/0	5/5	0/0	0/0	0/0	serde 1.0.138
0/0	0/0	0/0	0/0	0/0	typenum 1.15.0
0/0	0/0	0/0	0/0	0/0	crypto-common 0.1.3
1/1	292/292	20/20	8/8	5/5	generic-array 0.14.5
0/0	15/15	0/0	0/0	0/0	rand_core 0.6.3
1/4	47/149	1/1	0/0	3/3	getrandom 0.2.3
0/0	0/0	0/0	0/0	0/0	cfg-if 1.0.0
1/21	10/368	0/2	0/0	5/40	libc 0.2.126
0/0	5/5	0/0	0/0	0/0	serde 1.0.138
0/0	0/0	0/0	0/0	0/0	typenum 1.15.0
0/0	3/3	0/0	0/0	0/0	subtle 2.4.1
6/6	663/663	5/5	0/0	3/3	rayon 1.5.3
0/0	451/451	6/6	0/0	6/6	crossbeam-deque 0.8.1
0/0	0/0	0/0	0/0	0/0	cfg-if 1.0.0
3/3	421/433	9/9	0/0	26/26	crossbeam-epoch 0.9.5
0/0	0/0	0/0	0/0	0/0	cfg-if 1.0.0
4/4	85/85	14/14	0/0	2/2	crossbeam-utils 0.8.8
0/0	0/0	0/0	0/0	0/0	cfg-if 1.0.0
0/0	7/7	1/1	0/0	0/0	lazy_static 1.4.0
0/0	0/49	0/6	0/0	0/3	spin 0.5.2
0/0	7/7	1/1	0/0	0/0	lazy_static 1.4.0
0/0	0/0	0/0	0/0	0/0	memoffset 0.6.4
0/0	18/18	1/1	0/0	0/0	scopeguard 1.1.0
4/4	85/85	14/14	0/0	2/2	crossbeam-utils 0.8.8
0/0	0/0	0/0	0/0	0/0	either 1.7.0
0/0	5/5	0/0	0/0	0/0	serde 1.0.138
5/5	485/488	2/2	0/0	20/20	rayon-core 1.9.2
2/2	489/498	6/7	0/0	12/14	crossbeam-channel 0.5.5
0/0	0/0	0/0	0/0	0/0	cfg-if 1.0.0
4/4	85/85	14/14	0/0	2/2	crossbeam-deque 0.8.1
0/0	451/451	6/6	0/0	6/6	crossbeam-utils 0.8.8
4/4	85/85	14/14	0/0	2/2	num_cpus 1.13.1
0/0	65/72	0/0	0/0	0/0	libc 0.2.126
1/21	10/368	0/2	0/0	5/40	bv 0.11.1
2/2	206/206	0/0	0/0	7/7	serde 1.0.138
0/0	5/5	0/0	0/0	0/0	bytemuck 1.11.0
18/18	370/397	339/340	9/9	0/0	bytemuck_derive 1.1.0
0/0	0/0	0/0	0/0	0/0	?

0/0	0/0	0/0	0/0	0/0	?	
0/0	12/12	0/0	0/0	3/3	?	└ bytemuck derive 1.1.0 └ proc-macro2 1.0.41 └ quote 1.0.18 └ syn 1.0.98
0/0	0/0	0/0	0/0	0/0	?	└ byteorder 1.4.3 └ bzip2 0.4.3 └ bzip2-sys 0.1.11+1.0.8 └ libc 0.2.126 └ futures 0.1.31 └ libc 0.2.126
1/1	193/193	0/0	0/0	0/0	?	└ crossbeam-channel 0.5.5
0/0	73/73	2/2	0/0	2/2	?	└ dashmap 4.0.2 └ cfg-if 1.0.0 └ num_cpus 1.13.1 └ rayon 1.5.3 └ serde 1.0.138 └ dir-diff 0.3.2 └ walkdir 2.3.2 └ same-file 1.0.6
1/1	1/1	0/0	0/0	0/0	?	└ fflate2 1.0.24 └ crc32fast 1.2.1 └ cfg-if 1.0.0 └ miniz_oxide 0.5.1 └ adler 1.0.2
1/21	10/368	0/2	0/0	5/40	?	└ fnv 1.0.7 └ im 15.1.0 └ bitmaps 2.1.0 └ typenum 1.15.0 └ proptest 1.0.0 └ bit-set 0.5.2 └ bit-vec 0.6.3 └ serde 1.0.138
0/3	0/650	0/25	0/1	0/16	?	└ bitflags 1.3.2 └ byteorder 1.4.3 └ lazy_static 1.4.0 └ num-traits 0.2.15 └ quick-error 2.0.1 └ rand 0.8.5 └ libc 0.2.126 └ log 0.4.17 └ cfg-if 1.0.0 └ serde 1.0.138 └ rand_chacha 0.3.1 └ ppv-lite86 0.2.15 └ rand_core 0.6.3 └ serde 1.0.138 └ rand_core 0.6.3 └ serde 1.0.138 └ rand_chacha 0.3.1 └ rand_xorshift 0.3.0 └ rand_core 0.6.3 └ serde 1.0.138 └ regex-syntax 0.6.26 └ rusty-fork 0.3.0 └ fnv 1.0.7 └ quick-error 1.2.3 └ tempfile 3.3.0 └ cfg-if 1.0.0 └ fastrand 1.6.0 └ libc 0.2.126 └ remove_dir_all 0.5.3 └ wait-timeout 0.2.0 └ libc 0.2.126 └ tempfile 3.3.0 └ rand_core 0.6.3 └ rand_xoshiro 0.6.0 └ rand_core 0.6.3
1/21	10/368	0/2	0/0	5/40	?	
2/2	489/498	6/7	0/0	12/14	?	
2/2	143/143	32/32	0/0	6/6	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	65/72	0/0	0/0	0/0	?	
6/6	663/663	5/5	0/0	3/3	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	3/3	0/0	0/0	0/0	?	
0/2	41/118	0/2	0/0	0/2	?	
0/6	0/156	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	122/122	2/2	0/0	4/4	?	
0/0	100/100	0/0	0/0	9/9	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/9	0/0	0/0	0/0	?	
0/0	0/8	0/0	0/0	0/0	?	
0/0	0/4	0/0	0/0	0/2	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	193/193	0/0	0/0	0/0	?	
0/0	7/7	1/1	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/32	0/0	0/0	0/0	?	
1/21	10/368	0/2	0/0	5/40	?	
1/1	16/18	1/1	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/2	165/712	0/0	0/0	16/25	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	25/71	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/21	10/368	0/2	0/0	5/40	?	
0/0	0/79	0/0	0/0	0/0	?	
0/0	0/66	0/0	0/0	0/0	?	
1/21	10/368	0/2	0/0	5/40	?	
0/0	25/71	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	

0/0	15/15	0/0	0/0	0/0	?		
0/0	5/5	0/0	0/0	0/0	?		
6/6	663/663	5/5	0/0	3/3	?		
0/0	5/5	0/0	0/0	0/0	?		
0/1	323/643	0/0	0/0	20/39	?		
0/0	100/100	0/0	0/0	9/9	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	0/72	0/3	0/1	0/3	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	7/7	1/1	0/0	0/0	?		
1/1	16/18	1/1	0/0	0/0	?		
0/0	335/335	6/6	0/0	0/0	?		
1/1	1223/1367	21/24	1/1	62/69	?		
0/0	26/30	0/0	0/0	0/0	?		
1/4	47/149	1/1	0/0	3/3	?		
1/1	75/117	4/6	0/0	2/3	?		
0/0	5/5	0/0	0/0	0/0	?		
4/6	389/1096	3/9	1/1	12/25	?		
6/6	663/663	5/5	0/0	3/3	?		
0/0	5/5	0/0	0/0	0/0	?		
0/0	140/140	0/0	0/0	0/0	?		
1/21	10/368	0/2	0/0	5/40	?		
0/0	0/0	2/2	0/0	0/0	?		
1/21	10/368	0/2	0/0	5/40	?		
0/0	147/282	4/6	0/0	7/7	?		
1/21	10/368	0/2	0/0	5/40	?		
0/0	0/0	18/18	2/2	0/0	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	12/12	0/0	0/0	3/3	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	50/50	3/3	0/0	2/2	?		
0/0	6/12	0/0	0/0	0/0	?		
0/0	65/72	0/0	0/0	0/0	?		
1/1	75/117	4/6	0/0	2/3	?		
2/2	8/8	0/0	0/0	0/0	?		
0/0	68/68	14/14	0/0	2/2	?		
0/0	0/0	18/18	2/2	0/0	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	7/7	1/1	0/0	0/0	?		
0/0	34/34	1/2	0/0	2/2	?		
0/19	33/678	0/0	0/0	1/22	?		
2/37	361/2140	0/0	0/0	4/16	?		
1/21	10/368	0/2	0/0	5/40	?		
2/37	361/2140	0/0	0/0	4/16	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	12/12	0/0	0/0	3/3	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	12/12	0/0	0/0	3/3	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	50/50	3/3	0/0	2/2	?		
0/0	12/12	0/0	0/0	3/3	?		
0/0	0/0	0/0	0/0	0/0	?		
0/0	50/50	3/3	0/0	2/2	?		
0/0	0/0	18/18	2/2	0/0	?		
0/0	15/15	0/0	0/0	0/0	?		
1/4	47/150	1/1	0/0	3/3	?		
0/0	0/0	0/0	0/0	0/0	?		
1/21	10/368	0/2	0/0	5/40	?		
1/1	16/18	1/1	0/0	0/0	?		
1/21	10/368	0/2	0/0	5/40	?		
1/1	16/18	1/1	0/0	0/0	?		
0/0	0/0	0/0	0/0	0/0	?		

AUTOMATED TESTING

0/0	0/0	0/0	0/0	0/0	?	
0/2	165/712	0/0	0/0	16/25	?	
0/0	22/22	0/0	0/0	0/0		
1/4	47/150	1/1	0/0	3/3		
0/0	5/5	0/0	0/0	0/0		
0/0	22/22	0/0	0/0	0/0		
6/6	663/663	5/5	0/0	3/3		
0/0	34/34	1/2	0/0	2/2		
0/0	5/5	0/0	0/0	0/0		
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	22/22	0/0	0/0	0/0		
18/18	370/397	339/340	9/9	0/0		
1/1	16/18	1/1	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0		
0/0	5/5	0/0	0/0	0/0		
0/0	0/0	0/0	0/0	0/0	?	
0/0	26/30	0/0	0/0	0/0		
2/78	29/3973	0/0	0/0	0/0		
0/0	6/6	0/0	0/0	0/0		
0/0	3/3	0/0	0/0	0/0		
1/1	292/292	20/20	8/8	5/5		
0/0	1/1	0/0	0/0	0/0		
0/8	10/202	0/0	0/0	0/0	?	
0/0	6/6	0/0	0/0	0/0		
0/0	0/0	0/0	0/0	0/0	?	
1/1	14/14	0/0	0/0	0/0		
1/21	10/368	0/2	0/0	5/40		
0/0	0/0	0/0	0/0	0/0		
1/1	292/292	20/20	8/8	5/5	?	
0/0	0/0	0/0	0/0	0/0	?	
2/2	206/206	0/0	0/0	7/7	?	
1/1	193/193	0/0	0/0	0/0		
1/1	29/194	0/2	0/0	0/4		
0/0	190/284	0/2	0/0	4/6		
1/21	10/368	0/2	0/0	5/40		
0/0	0/0	0/0	0/0	0/0	?	
1/1	292/292	20/20	8/8	5/5	?	
1/4	47/150	1/1	0/0	3/3		
1/1	1223/1367	21/24	1/1	62/69		
1/1	122/122	2/2	0/0	4/4		
0/0	7/7	1/1	0/0	0/0		
1/1	16/18	1/1	0/0	0/0		
0/0	147/282	4/6	0/0	7/7		
1/1	75/117	4/6	0/0	2/3		
1/1	75/117	4/6	0/0	2/3		
0/0	15/15	0/0	0/0	0/0		
0/0	5/5	0/0	0/0	0/0		
0/0	16/16	0/0	0/0	0/0		
0/0	5/5	0/0	0/0	0/0		
0/0	0/0	0/0	0/0	0/0	?	
0/0	4/7	0/0	0/0	0/0		
0/0	41/46	1/1	0/0	0/0		
1/1	1223/1367	21/24	1/1	62/69	?	
6/6	663/663	5/5	0/0	3/3		
0/0	5/5	0/0	0/0	0/0		
0/0	7/7	0/0	0/0	0/0		
8/12	674/921	0/0	0/0	2/2		
0/0	5/5	0/0	0/0	0/0		
0/8	4/196	0/0	0/0	0/0		
0/0	0/0	0/0	0/0	0/0	?	
1/1	14/14	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0		
0/0	0/0	0/0	0/0	0/0	?	
0/0	12/12	0/0	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	

AUTOMATED TESTING

0/0	0/0	0/0	0/0	?
0/0	50/50	3/3	0/0	2/2
0/0	3/3	0/0	0/0	0/0
0/0	0/0	0/0	0/0	?
0/0	0/0	0/0	0/0	?
0/0	12/12	0/0	0/0	3/3
0/0	0/0	0/0	0/0	0/0
0/0	50/50	3/3	0/0	2/2
0/0	0/0	0/0	0/0	?
3/3	442/442	1/1	0/0	3/3
0/0	0/0	0/0	0/0	?
0/0	22/22	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
2/78	29/3973	0/0	0/0	0/0
0/0	7/7	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	0/0	0/0	0/0	?
0/0	0/0	0/0	0/0	?
0/0	12/12	0/0	0/0	3/3
0/0	0/0	0/0	0/0	?
0/0	50/50	3/3	0/0	2/2
0/0	0/0	0/0	0/0	?
0/0	12/12	0/0	0/0	3/3
0/0	0/0	0/0	0/0	?
0/0	50/50	3/3	0/0	2/2
0/0	0/0	0/0	0/0	?
0/0	12/12	0/0	0/0	3/3
0/0	0/0	0/0	0/0	?
0/0	5/5	0/0	0/0	0/0
0/0	12/12	0/0	0/0	3/3
0/0	50/50	3/3	0/0	2/2
2/2	1064/1198	19/22	1/1	51/58
0/0	26/30	0/0	0/0	0/0
4/6	389/1096	3/9	1/1	12/25
6/6	663/663	5/5	0/0	3/3
0/0	5/5	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	1/1	0/0	0/0	0/0
2/2	206/206	0/0	0/0	7/7
18/18	370/397	339/340	9/9	0/0
0/2	0/857	0/0	0/0	0/0
1/1	193/193	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	22/22	0/0	0/0	0/0
0/0	5/5	0/0	0/0	0/0
0/0	3/3	0/0	0/0	0/0
1/1	23/23	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	12/12	0/0	0/0	3/3
0/0	0/0	0/0	0/0	0/0
0/0	50/50	3/3	0/0	2/2
0/0	0/0	0/0	0/0	0/0
0/0	0/72	0/3	0/1	0/3
0/0	0/72	0/3	0/1	0/3
0/0	7/7	1/1	0/0	0/0
1/21	10/368	0/2	0/0	5/40
0/0	4/4	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	0/0	0/0	0/0	?
0/0	0/0	0/0	0/0	?
1/1	292/292	20/20	8/8	5/5
0/0	0/0	0/0	0/0	0/0

AUTOMATED TESTING

0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	292/292	20/20	8/8	5/5	?	
0/0	3/3	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	7/7	1/1	0/0	0/0	?	
0/0	33/33	0/0	0/0	2/2	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	3/3	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/8	10/202	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	16/18	1/1	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/1	0/1	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	16/16	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	4/7	0/0	0/0	0/0	?	
0/8	4/196	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	12/12	0/0	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/1	0/1	0/0	0/0	0/0	?	
0/0	50/50	3/3	0/0	2/2	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
15/18	442/449	3/3	0/0	11/11	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	75/117	4/6	0/0	2/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	22/22	0/0	0/0	0/0	?	
6/6	663/663	5/5	0/0	3/3	?	
0/8	10/202	0/0	0/0	0/0	?	
0/0	3/3	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/8	10/202	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	20/20	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	23/23	0/0	0/0	0/0	?	
12/14	432/496	16/16	2/2	9/9	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	4/7	0/0	0/0	0/0	?	
0/1	0/0	0/1	0/0	0/1	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	

0/0	0/0	0/0	0/0	0/0	?	
0/0	12/12	0/0	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	50/50	3/3	0/0	2/2	?	
0/0	0/0	0/0	0/0	0/0	?	
4/6	389/1096	3/9	1/1	12/25	?	
1/1	16/18	1/1	0/0	0/0	?	
1/1	75/117	4/6	0/0	2/3	?	
0/0	12/12	0/0	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	50/50	3/3	0/0	2/2	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	23/23	0/0	0/0	0/0	?	
0/0	2/2	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	22/22	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	12/12	0/0	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	50/50	3/3	0/0	2/2	?	
0/0	0/72	0/3	0/1	0/3	?	
1/21	10/368	0/2	0/0	5/40	?	
0/4	111/272	8/12	0/0	10/15	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	16/18	1/1	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	16/18	1/1	0/0	0/0	?	
3/3	445/445	1/1	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	22/22	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	7/7	0/0	0/0	0/0	?	
0/0	1/1	0/0	0/0	0/0	?	
18/18	370/397	339/340	9/9	0/0	?	
1/1	193/193	0/0	0/0	0/0	?	
1/1	44/90	2/2	0/0	0/0	?	
1/21	10/368	0/2	0/0	5/40	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
1/1	216/216	0/0	0/0	0/0	?	
1/21	10/368	0/2	0/0	5/40	?	
0/2	0/857	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/2	0/857	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	16/16	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	22/22	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	

AUTOMATED TESTING

0/0	36/37	0/0	0/0	1/1	?
26/26	385/391	1/1	0/0	1/1	?
0/0	36/37	0/0	0/0	1/1	?
0/0	7/8	0/0	0/0	2/2	?
0/0	73/73	2/2	0/0	2/2	?
0/2	41/118	0/2	0/0	0/2	?
0/0	30/30	2/2	0/0	0/0	?
0/0	0/0	0/0	0/0	0/0	?
2/37	361/2140	0/0	0/0	4/16	?
0/0	8/167	0/0	0/0	0/0	?
20/25	1474/1834	96/102	1/1	61/69	?
17/17	538/630	11/13	1/1	15/19	?
0/0	5/5	0/0	0/0	0/0	?
1/21	10/368	0/2	0/0	5/40	?
2/37	361/2140	0/0	0/0	4/16	?
1/2	164/625	2/7	0/0	13/21	?
1/21	10/368	0/2	0/0	5/40	?
1/1	16/18	1/1	0/0	0/0	?
0/0	65/72	0/0	0/0	0/0	?
1/1	75/117	4/6	0/0	2/3	?
0/1	0/399	0/17	0/0	0/25	?
0/0	0/2	0/0	0/0	0/0	?
0/0	0/0	0/0	0/0	0/0	?
0/0	0/534	0/28	0/14	0/24	?
0/0	18/18	1/1	0/0	0/0	?
0/0	5/5	0/0	0/0	0/0	?
0/16	0/1359	0/0	0/0	0/56	?
0/0	0/0	0/0	0/0	0/0	?
0/0	0/2	0/0	0/0	0/0	?
1/21	10/368	0/2	0/0	5/40	?
0/1	0/392	0/7	0/1	0/13	?
0/0	5/5	0/0	0/0	0/0	?
0/0	8/167	0/0	0/0	0/0	?
0/6	0/109	0/0	0/0	0/1	?
1/21	10/368	0/2	0/0	5/40	?
0/0	0/0	0/0	0/0	0/0	?
0/0	12/12	0/0	0/0	3/3	?
0/0	0/0	0/0	0/0	0/0	?
0/0	50/50	3/3	0/0	2/2	?
0/0	9/9	0/0	0/0	0/0	?
1/1	367/367	9/9	1/1	4/4	?
1/21	10/368	0/2	0/0	5/40	?
0/6	0/19	0/0	0/0	0/0	?
1/21	10/368	0/2	0/0	5/40	?
1/1	367/367	9/9	1/1	4/4	?
0/0	0/0	0/0	0/0	0/0	?
17/17	538/630	11/13	1/1	15/19	?
0/8	922/961	0/0	0/0	1/1	?
0/0	0/0	0/0	0/0	0/0	?
0/0	5/5	0/0	0/0	0/0	?
0/0	30/30	2/2	0/0	0/0	?
1/5	492/515	24/25	0/0	9/11	?
0/3	0/650	0/25	0/1	0/16	?
0/0	83/83	8/8	0/0	3/3	?
0/0	30/30	2/2	0/0	0/0	?
0/0	2/2	0/0	0/0	0/0	?
0/0	30/30	2/2	0/0	0/0	?
0/0	0/0	0/0	0/0	0/0	?
0/0	0/0	0/0	0/0	0/0	?
0/0	12/12	0/0	0/0	3/3	?
0/0	0/0	0/0	0/0	0/0	?
0/0	50/50	3/3	0/0	2/2	?
0/0	2/2	0/0	0/0	0/0	?
9/9	79/79	12/12	1/1	11/11	?
2/37	361/2140	0/0	0/0	4/16	?
0/0	8/167	0/0	0/0	0/0	?
0/0	0/0	0/0	0/0	0/0	?

AUTOMATED TESTING

0/0	0/0	0/0	0/0	?	
0/0	25/25	0/0	0/0	3/3	radioactive
0/0	5/5	0/0	0/0	0/0	radioactive
0/0	3/3	0/0	0/0	0/0	radioactive
17/17	538/630	11/13	1/1	15/19	radioactive
0/0	0/0	0/0	0/0	0/0	?
0/0	30/30	2/2	0/0	0/0	radioactive
0/0	2/2	0/0	0/0	0/0	radioactive
1/5	492/515	24/25	0/0	9/11	radioactive
1/1	166/170	10/10	0/0	2/2	radioactive
17/17	538/630	11/13	1/1	15/19	radioactive
0/0	0/0	0/0	0/0	0/0	?
0/0	7/7	0/0	0/0	0/0	radioactive
0/0	41/46	1/1	0/0	0/0	radioactive
0/0	25/25	0/0	0/0	3/3	radioactive
20/25	1474/1834	96/102	1/1	61/69	radioactive
2/2	333/350	5/5	0/0	6/6	radioactive
17/17	538/630	11/13	1/1	15/19	radioactive
0/0	30/30	2/2	0/0	0/0	radioactive
0/0	0/0	0/0	0/0	0/0	?
0/0	2/2	0/0	0/0	0/0	radioactive
1/5	492/515	24/25	0/0	9/11	radioactive
1/1	16/18	1/1	0/0	0/0	radioactive
0/0	8/167	0/0	0/0	0/0	radioactive
0/0	25/25	0/0	0/0	3/3	radioactive
20/25	1474/1834	96/102	1/1	61/69	radioactive
0/0	0/0	1/1	0/0	0/0	radioactive
0/0	0/0	0/0	0/0	0/0	?
1/1	16/18	1/1	0/0	0/0	radioactive
0/0	8/167	0/0	0/0	0/0	radioactive
0/0	0/0	0/0	0/0	0/0	?
0/0	12/12	0/0	0/0	3/3	radioactive
0/0	0/0	0/0	0/0	0/0	?
0/0	50/50	3/3	0/0	2/2	radioactive
0/0	35/56	0/4	0/0	2/2	radioactive
0/0	7/7	1/1	0/0	0/0	radioactive
1/1	166/170	10/10	0/0	2/2	radioactive
0/0	8/8	0/0	0/0	0/0	radioactive
17/17	538/630	11/13	1/1	15/19	radioactive
1/1	166/170	10/10	0/0	2/2	radioactive
0/0	8/167	0/0	0/0	0/0	radioactive
0/1	54/72	2/13	0/1	3/3	radioactive
17/17	538/630	11/13	1/1	15/19	radioactive
0/0	83/83	8/8	0/0	3/3	radioactive
0/0	30/30	2/2	0/0	0/0	radioactive
1/5	492/515	24/25	0/0	9/11	radioactive
0/0	3/3	0/0	0/0	0/0	radioactive
1/1	166/170	10/10	0/0	2/2	radioactive
0/0	8/8	0/0	0/0	0/0	radioactive
2/14	119/255	0/0	0/0	3/3	radioactive
0/0	5/5	0/0	0/0	0/0	radioactive
0/0	7/7	0/0	0/0	0/0	radioactive
1/21	10/368	0/2	0/0	5/40	radioactive
0/0	8/167	0/0	0/0	0/0	radioactive
3/6	528/641	2/4	0/0	3/4	radioactive
1/21	10/368	0/2	0/0	5/40	radioactive
20/25	1474/1834	96/102	1/1	61/69	radioactive
0/0	0/0	0/0	0/0	0/0	?
0/0	0/0	1/1	0/0	0/0	radioactive
0/0	0/0	0/0	0/0	0/0	?
1/1	16/18	1/1	0/0	0/0	radioactive
0/0	22/22	2/2	0/0	1/1	radioactive
0/0	0/0	0/0	0/0	0/0	?
1/1	166/170	10/10	0/0	2/2	radioactive
0/1	54/72	2/13	0/1	3/3	radioactive
1/1	16/18	1/1	0/0	0/0	radioactive
0/0	0/5	0/0	0/0	0/0	?

AUTOMATED TESTING

0/0	0/5	0/0	0/0	0/0
1/1	16/18	1/1	0/0	0/0
1/1	468/468	13/13	5/5	1/1
0/0	0/0	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
1/1	468/468	13/13	5/5	1/1
0/0	0/0	0/0	0/0	0/0
20/25	1474/1834	96/102	1/1	61/69
0/0	0/0	0/0	0/0	0/0
0/0	0/5	0/0	0/0	0/0
20/25	1474/1834	96/102	1/1	61/69
0/0	0/0	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
17/17	538/630	11/13	1/1	15/19
0/1	54/72	2/13	0/1	3/3
0/0	0/36	0/0	0/0	0/0
0/0	7/7	1/1	0/0	0/0
1/21	10/368	0/2	0/0	5/40
0/5	0/1572	0/22	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	0/643	0/12	0/4	0/12
1/1	44/90	2/2	0/0	0/0
0/0	0/3	0/0	0/0	0/2
1/21	10/368	0/2	0/0	5/40
0/0	0/3	0/0	0/0	0/2
1/21	10/368	0/2	0/0	5/40
1/1	16/18	1/1	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	0/3	0/0	0/0	0/2
1/21	10/368	0/2	0/0	5/40
0/0	0/0	0/0	0/0	0/0
0/0	25/71	0/0	0/0	0/0
20/25	1474/1834	96/102	1/1	61/69
0/0	0/13	0/2	0/0	0/0
0/0	0/36	0/0	0/0	0/0
20/25	1474/1834	96/102	1/1	61/69
0/0	0/0	0/0	0/0	0/0
0/0	5/5	0/0	0/0	0/0
0/0	7/7	1/1	0/0	0/0
1/1	16/18	1/1	0/0	0/0
0/0	0/2	0/0	0/0	0/0
0/0	0/36	0/0	0/0	0/0
0/0	3/3	0/0	0/0	0/0
0/0	8/167	0/0	0/0	0/0
0/0	0/5	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	5/5	0/0	0/0	0/0
0/0	4/7	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	2/2	0/0	0/0	0/0
0/0	0/0	0/0	0/0	0/0
0/0	3/3	0/0	0/0	0/0
0/0	7/7	0/0	0/0	0/0
8/12	674/921	0/0	0/0	2/2
0/0	5/5	0/0	0/0	0/0
20/25	1474/1834	96/102	1/1	61/69
0/0	0/13	0/2	0/0	0/0
0/0	0/0	0/0	0/0	0/0
2/2	332/349	5/5	0/0	6/6
17/17	538/630	11/13	1/1	15/19
0/0	30/30	2/2	0/0	0/0

AUTOMATED TESTING

0/0	30/30	2/2	0/0	0/0	?		futures-core 0.3.21
0/0	0/0	0/0	0/0	0/0	?		futures-io 0.3.21
0/0	2/2	0/0	0/0	0/0	?		futures-sink 0.3.21
1/5	492/515	24/25	0/0	9/11	?		futures-util 0.3.21
0/0	8/167	0/0	0/0	0/0	?		pin-project-lite 0.2.7
0/0	25/25	0/0	0/0	3/3	?		slab 0.4.5
20/25	1474/1834	96/102	1/1	61/69	?		tokio 1.14.1
0/0	0/0	1/1	0/0	0/0	?		tracing 0.1.29
0/0	0/0	0/0	0/0	0/0	?		tower-service 0.3.1
0/0	0/0	0/0	0/0	0/0	?		url 2.2.2
0/0	0/0	0/0	0/0	0/0	?		form_urlencoded 1.0.1
0/0	0/0	0/0	0/0	0/0	?		idna 0.2.3
0/0	0/0	0/0	0/0	0/0	?		matches 0.1.9
0/0	0/0	0/0	0/0	0/0	?		unicode-bidi 0.3.7
0/0	5/5	0/0	0/0	0/0	?		serde 1.0.138
0/0	20/20	0/0	0/0	0/0	?		unicode-normalization 0.1.19
0/0	0/0	0/0	0/0	0/0	?		matches 0.1.9
0/0	3/3	0/0	0/0	0/0	?		percent-encoding 2.1.0
0/0	5/5	0/0	0/0	0/0	?		serde 1.0.138
0/0	0/0	0/0	0/0	0/0	?		webpki-roots 0.22.1
3/3	445/445	1/1	0/0	3/3	?		solana-sdk 1.14.13
3/3	445/445	1/1	0/0	3/3	?		thiserror 1.0.31
0/0	0/0	0/0	0/0	0/0	?		solana-sdk 1.14.13
3/3	445/445	1/1	0/0	3/3	?		thiserror 1.0.31
0/0	0/0	0/0	0/0	0/0	?		solana-bucket-map 1.14.13
1/1	16/18	1/1	0/0	0/0	?		log 0.4.17
0/0	147/282	4/6	0/0	7/7	?		memmap2 0.5.3
0/0	0/0	0/0	0/0	0/0	?		modular-bitfield 0.11.2
0/0	0/0	0/0	0/0	0/0	?		modular-bitfield-impl 0.11.2
0/0	12/12	0/0	0/0	3/3	?		proc-macro2 1.0.41
0/0	0/0	0/0	0/0	0/0	?		quote 1.0.18
0/0	50/50	3/3	0/0	2/2	?		syn 1.0.98
0/0	0/0	0/0	0/0	0/0	?		static_assertions 1.1.0
0/0	15/15	0/0	0/0	0/0	?		rand 0.7.3
0/0	0/0	0/0	0/0	0/0	?		solana-measure 1.14.13
3/3	445/445	1/1	0/0	3/3	?		solana-sdk 1.14.13
0/0	25/71	0/0	0/0	0/0	?		tempfile 3.3.0
0/0	0/0	0/0	0/0	0/0	?		solana-compute-budget-program 1.14.13
0/0	2/2	0/0	0/0	0/0	?		solana-program-runtime 1.14.13
3/3	445/445	1/1	0/0	3/3	?		solana-sdk 1.14.13
0/0	0/0	0/0	0/0	0/0	?		solana-config-program 1.14.13
0/0	22/22	0/0	0/0	0/0	?		bincode 1.3.3
1/1	44/90	2/2	0/0	0/0	?		chrono 0.4.19
0/0	5/5	0/0	0/0	0/0	?		serde 1.0.138
0/0	0/0	0/0	0/0	0/0	?		serde_derive 1.0.138
0/0	2/2	0/0	0/0	0/0	?		solana-program-runtime 1.14.13
3/3	445/445	1/1	0/0	3/3	?		solana-sdk 1.14.13
0/0	0/0	0/0	0/0	0/0	?		solana-frozen-abi 1.14.13
0/0	0/0	0/0	0/0	0/0	?		solana-frozen-abi-macro 1.14.13
0/0	0/0	0/0	0/0	0/0	?		solana-measure 1.14.13
0/0	10/10	0/0	0/0	0/0	?		solana-metrics 1.14.13
0/0	2/2	0/0	0/0	0/0	?		solana-program-runtime 1.14.13
0/0	0/0	0/0	0/0	0/0	?		solana-rayon-threadlimit 1.14.13
0/0	7/7	1/1	0/0	0/0	?		lazy_static 1.4.0
0/0	65/72	0/0	0/0	0/0	?		num_cpus 1.13.1
3/3	445/445	1/1	0/0	3/3	?		solana-sdk 1.14.13
0/0	0/0	0/0	0/0	0/0	?		solana-stake-program 1.14.13
0/0	22/22	0/0	0/0	0/0	?		bincode 1.3.3
1/1	16/18	1/1	0/0	0/0	?		log 0.4.17
0/0	0/0	0/0	0/0	0/0	?		num-derive 0.3.3
0/0	6/12	0/0	0/0	0/0	?		num-traits 0.2.15
0/0	5/5	0/0	0/0	0/0	?		serde 1.0.138
0/0	0/0	0/0	0/0	0/0	?		serde_derive 1.0.138
0/0	0/0	0/0	0/0	0/0	?		solana-config-program 1.14.13
0/0	0/0	0/0	0/0	0/0	?		solana-frozen-abi 1.14.13
0/0	0/0	0/0	0/0	0/0	?		solana-frozen-abi-macro 1.14.13

0/0	0/0	0/0	0/0	0/0	?	
0/0	10/10	0/0	0/0	0/0	?	
0/0	2/2	0/0	0/0	0/0	?	
3/3	445/445	1/1	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	22/22	0/0	0/0	0/0	?	
1/1	16/18	1/1	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	10/10	0/0	0/0	0/0	?	
0/0	2/2	0/0	0/0	0/0	?	
3/3	445/445	1/1	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
18/18	370/397	339/340	9/9	0/0	?	
1/4	47/150	1/1	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0	?	
0/0	2/2	0/0	0/0	0/0	?	
3/3	445/445	1/1	0/0	3/3	?	
0/0	70/70	18/18	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	292/292	20/20	8/8	5/5	?	
0/0	15/15	0/0	0/0	0/0	?	
0/28	0/1060	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	292/292	20/20	8/8	5/5	?	
1/1	14/14	0/0	0/0	0/0	?	
0/0	3/3	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/3	0/137	0/0	0/0	0/2	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	14/14	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	292/292	20/20	8/8	5/5	?	
0/0	3/3	0/0	0/0	0/0	?	
1/1	23/23	0/0	0/0	0/0	?	
0/0	3/3	0/0	0/0	0/0	?	
1/1	23/23	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	22/22	0/0	0/0	0/0	?	
18/18	370/397	339/340	9/9	0/0	?	
1/1	193/193	0/0	0/0	0/0	?	
0/0	7/7	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	126/126	0/0	0/0	3/3	?	
1/1	292/292	20/20	8/8	5/5	?	
0/2	0/857	0/0	0/0	0/0	?	
1/4	47/150	1/1	0/0	3/3	?	
0/0	0/72	0/3	0/1	0/3	?	
0/0	7/7	1/1	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
1/1	193/193	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	

0/0	0/0	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
1/1	23/23	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	6/12	0/0	0/0	0/0	?	
0/0	15/15	0/0	0/0	0/0	?	
0/0	5/5	0/0	0/0	0/0	?	
0/0	4/7	0/0	0/0	0/0	?	
0/0	14/14	0/0	0/0	0/0	?	
0/0	6/6	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
3/3	442/442	1/1	0/0	3/3	?	
3/3	445/445	1/1	0/0	3/3	?	
0/0	3/3	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/1	23/23	0/0	0/0	0/0	?	
0/0	70/70	18/18	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	12/12	0/0	0/0	3/3	?	
0/0	0/0	0/0	0/0	0/0	?	
0/1	0/1	0/0	0/0	0/0	?	
0/0	50/50	3/3	0/0	2/2	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	0/47	0/0	0/0	0/0	?	
2/2	52/52	0/0	0/0	0/0	?	
0/0	35/78	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
1/21	10/368	0/2	0/0	5/40	?	
1/21	10/368	0/2	0/0	5/40	?	
9/11	88/175	0/0	0/0	0/0	?	
1/21	10/368	0/2	0/0	5/40	?	
0/0	25/71	0/0	0/0	0/0	?	
0/0	0/0	0/0	0/0	0/0	?	
0/0	9/9	0/0	0/0	0/0	?	
212/571		19896/40757	796/983	33/55	503/825	

THANK YOU FOR CHOOSING
HALBORN