

Multi-Currency Wallet Simulator

Static Testing + White-Box Coverage

Static analysis is executed automatically in the CI pipeline on every push and pull request. Py-lint is included as a fast linter gate, while SonarCloud is the primary static analysis tool, for: maintainability/security reporting and for importing the unit-test coverage report (coverage.xml). This makes the static results reproducible and consistent.

Coverage measurements: Coverage was calculated using pytest-cov and interpreted as statement coverage (executed lines) and decision/branch coverage (executed conditional paths). This report two views because they answer different questions:

- **Unit-test coverage:** how much of the internal Python logic (domain + services) is executed by unit tests (white-box focus).
- **Unit + integration execution:** how much of the full vertical slice is executed when integration tests are included (routes → services → repositories → SQLite).

Metric	Before	After
Unit coverage (pytest-cov)	41% (108 tests)	63% (127 tests)
Executed lines (statement) incl. integration	89% (116 tests)	93% (135 tests)
SonarCloud coverage (coverage.xml)	40.9%	63.4%
SonarCloud quality gate	Passed	Passed

Meaning (how to read the numbers)

- **Unit coverage (41% → 63%)** increased because we added targeted white-box unit tests for previously unexecuted branches/decisions in internal logic (services + rules).
- **Unit+integration (89% → 93%)** The combined coverage is already high because integration tests execute many lines through the API wiring. The smaller increase means the main gap was branch coverage inside logic, not missing route execution.
- **SonarCloud (40.9% → 63.4%)** matches the unit view because it imports unit-test coverage.xml, so it reflects improvement in white-box unit coverage.

Coverage gap → action → outcome

Coverage gap	White-box tests added	Value / outcome
Did not handle “non-numeric rate” safely	White-box tests for malformed FX payloads	Bug fixed: API now fails predictably (502) instead of crashing
Service-layer “happy path” never executed	White-box test for list_transactions	Confirms service works without needing DB/HTTP
Exchange decision branches were not executed	White-box tests targeting exchange rule branches	Higher confidence that key rule decisions are exercised by tests

Conclusion: Static analysis and coverage are integrated into CI and therefore reproducible. Coverage was used diagnostically to identify unexecuted internal branches, and targeted white-box tests increased unit coverage (41% → 63%) and directly improved robustness at the external FX boundary error and domain logic coverage.

1 Evidence screenshots for coverage

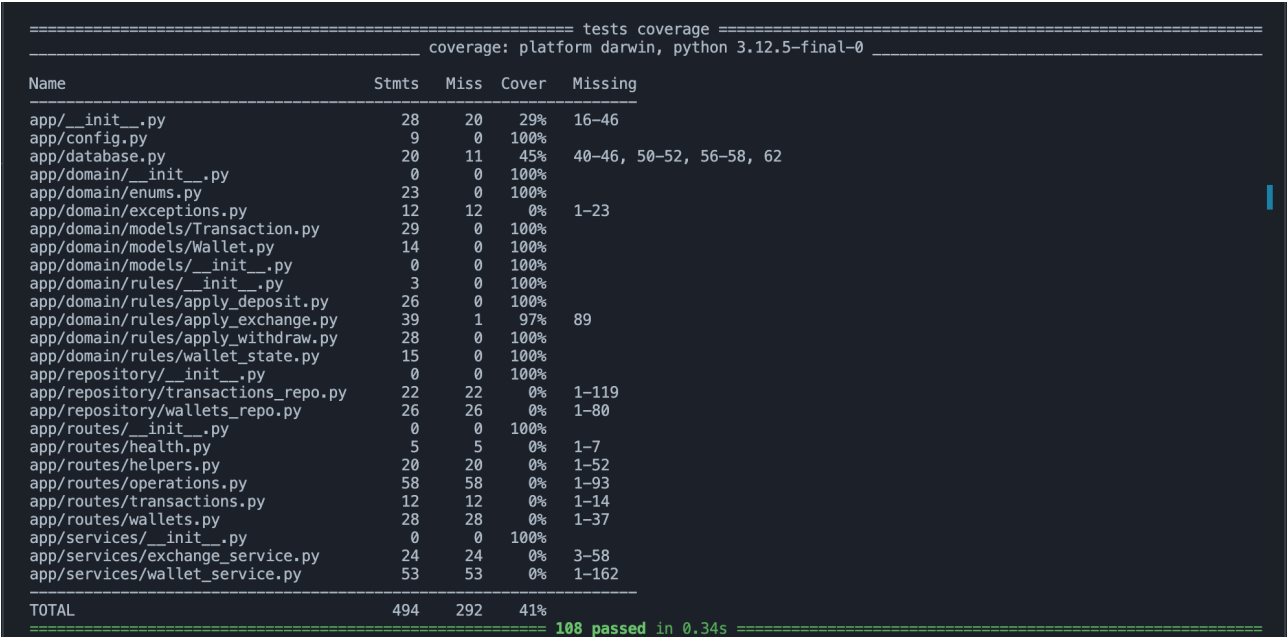


Figure A 1: Unit coverage (pytest-cov), before white-box additions

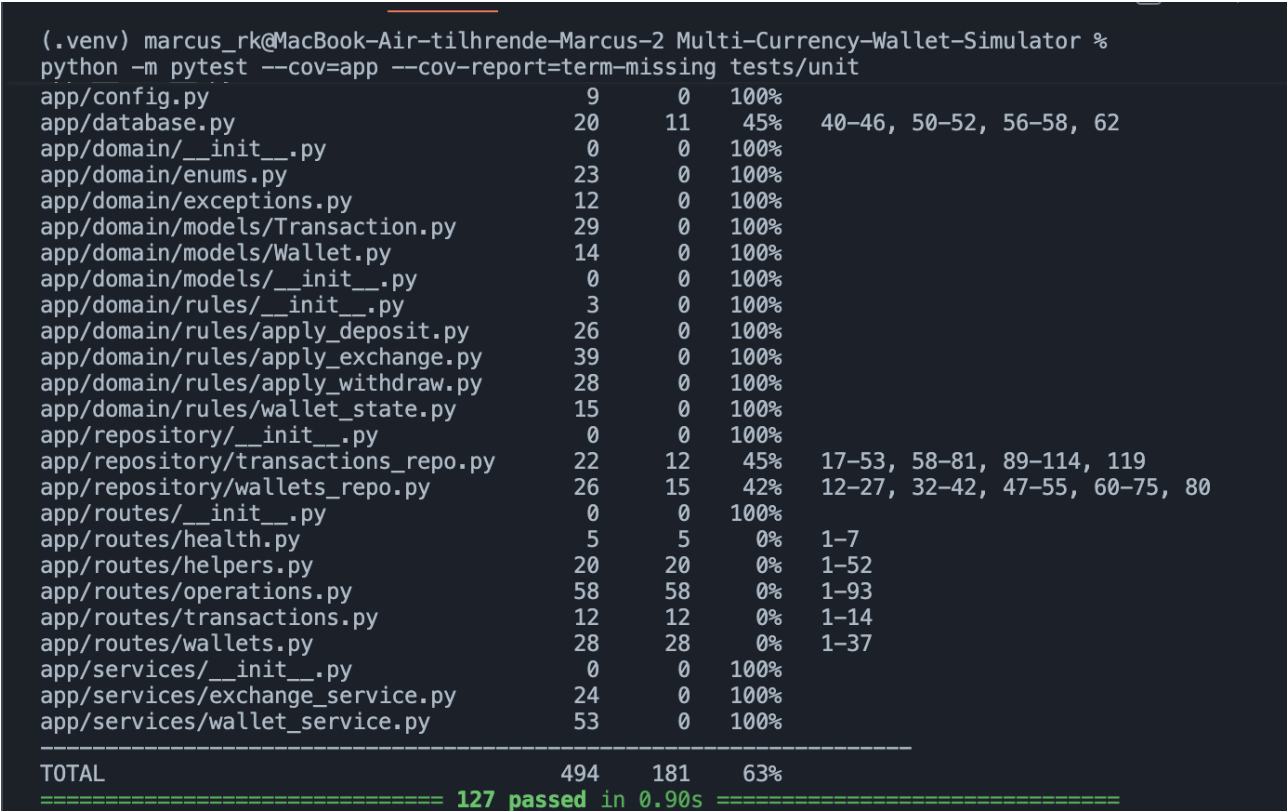
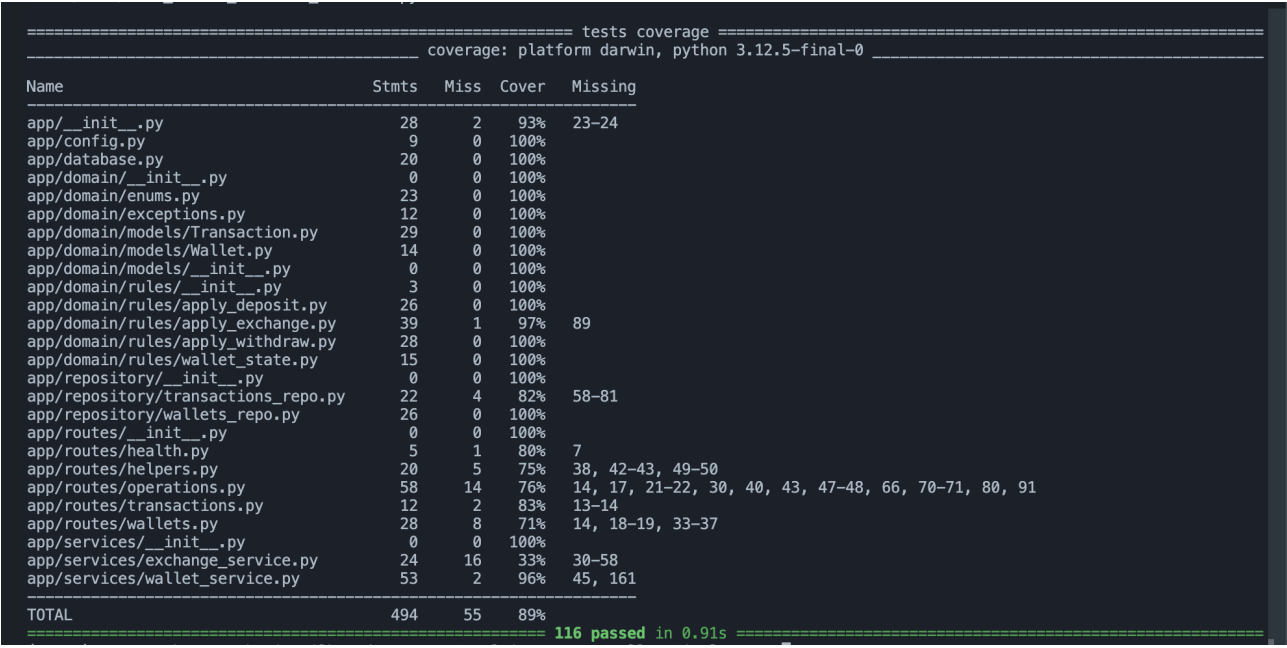


Figure A 2: Unit coverage (pytest-cov), after white-box additions

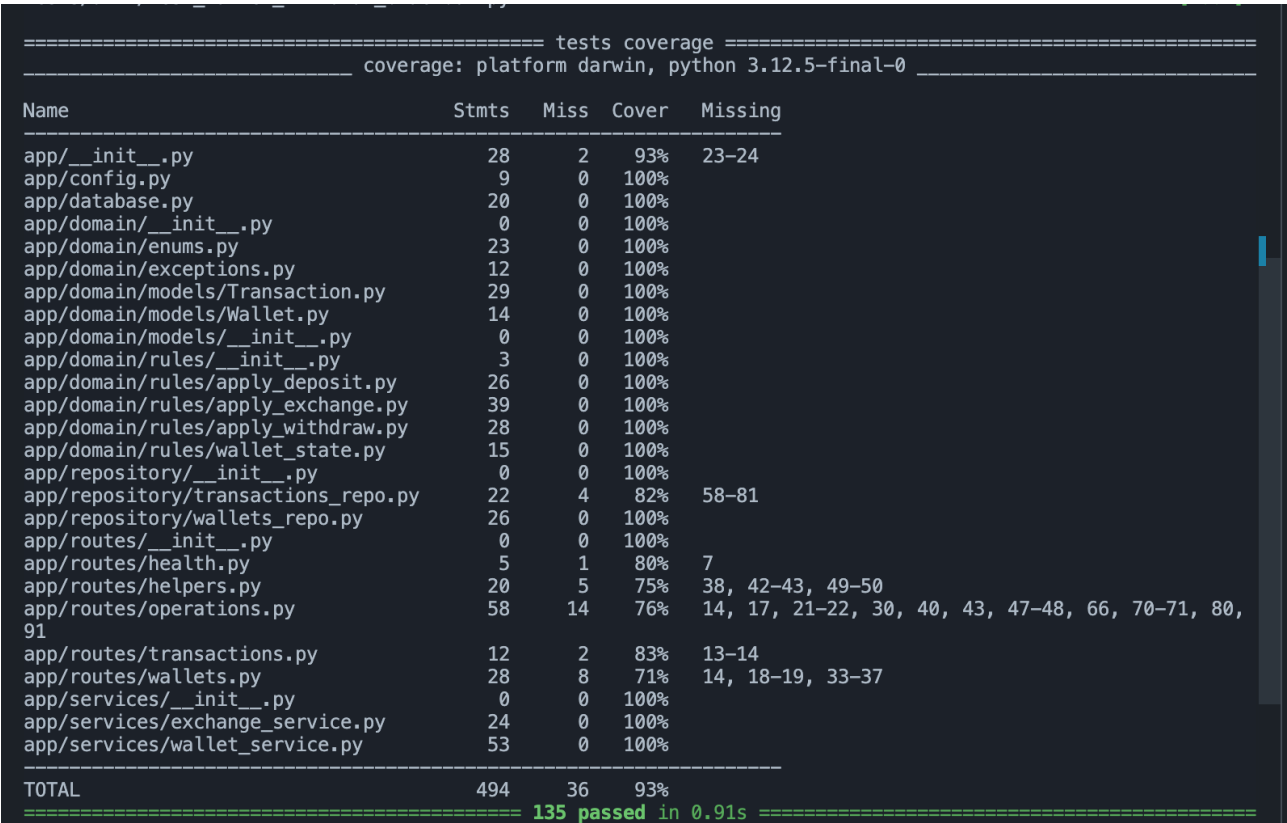
1



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Figure A 3: Combined execution (unit + integration), before white-box additions

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Figure A 4: Combined execution (unit + integration), after white-box additions

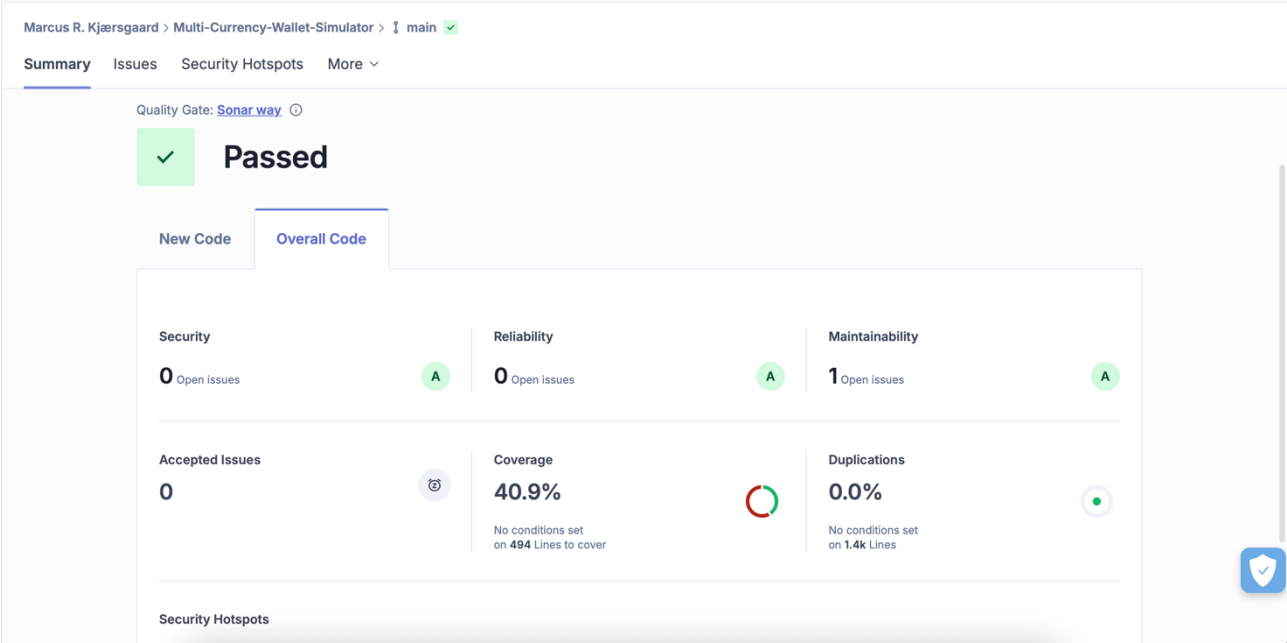


Figure A 5: SonarCloud overview (imports unit coverage.xml), before white-box additions

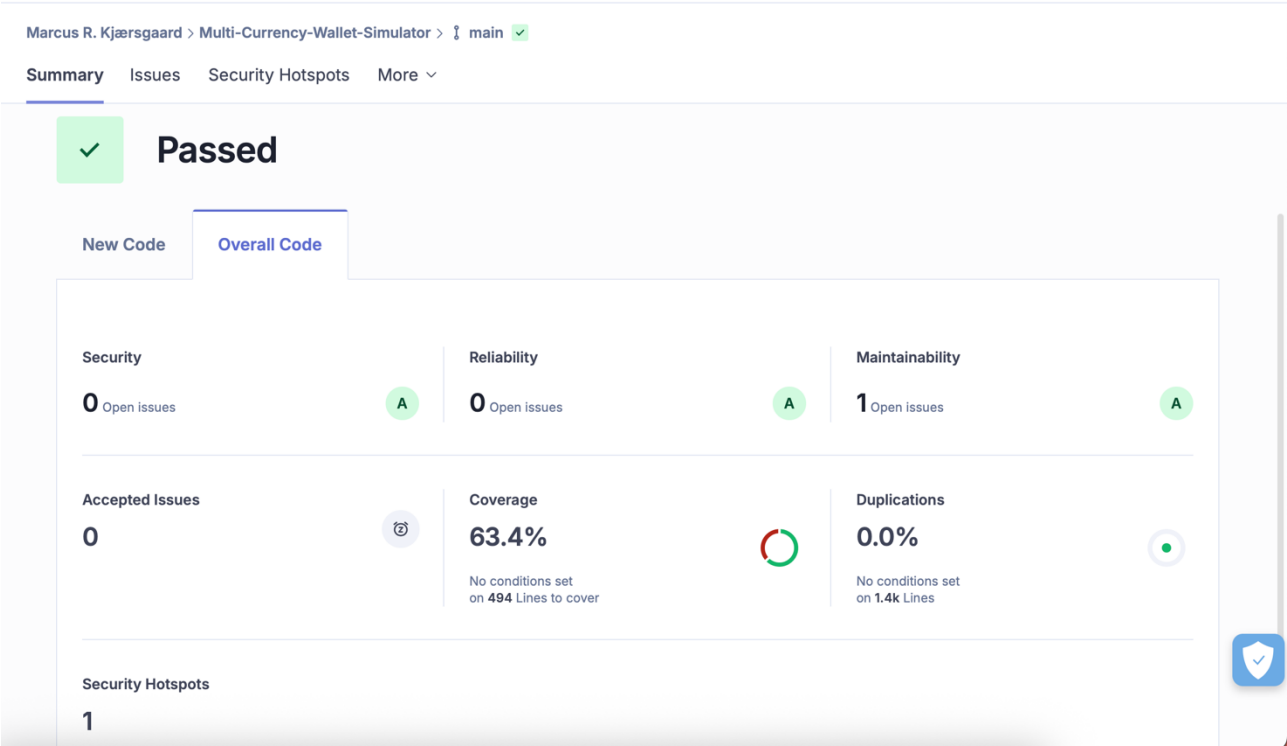


Figure A 6: SonarCloud overview (imports unit coverage.xml), after white-box additions