

API Smoke Test Platform – Architectural Overview

Contract-driven automation suite that turns OpenAPI specifications into executable smoke tests and mock servers using a modern Python 3.12+ toolchain managed by Hatch and uv.

1. Executive Summary & System Context

The platform converts OpenAPI contracts into infrastructure-free smoke coverage in minutes. It emphasizes three pillars documented in [README.md](#):

- **Zero-config pipeline:** `scripts/run-smoke-pipeline.ps1` inspects any spec in `specs/` and orchestrates parsing, mock generation, scenario building, mock runtime startup, and smoke execution with sensible defaults (ports, output dirs, console format).
- **Modern tooling:** Python 3.12+, uv for dependency resolution, Hatch for task automation, Ruff for formatting/linting, mypy for type checking, and pytest for unit coverage (see [pyproject.toml](#)).
- **Rich observability:** Structured logging via `structlog`, multiple console renderers (auto/rich/plain/json), timestamped `runs/` artifacts, and deterministic mock payloads.

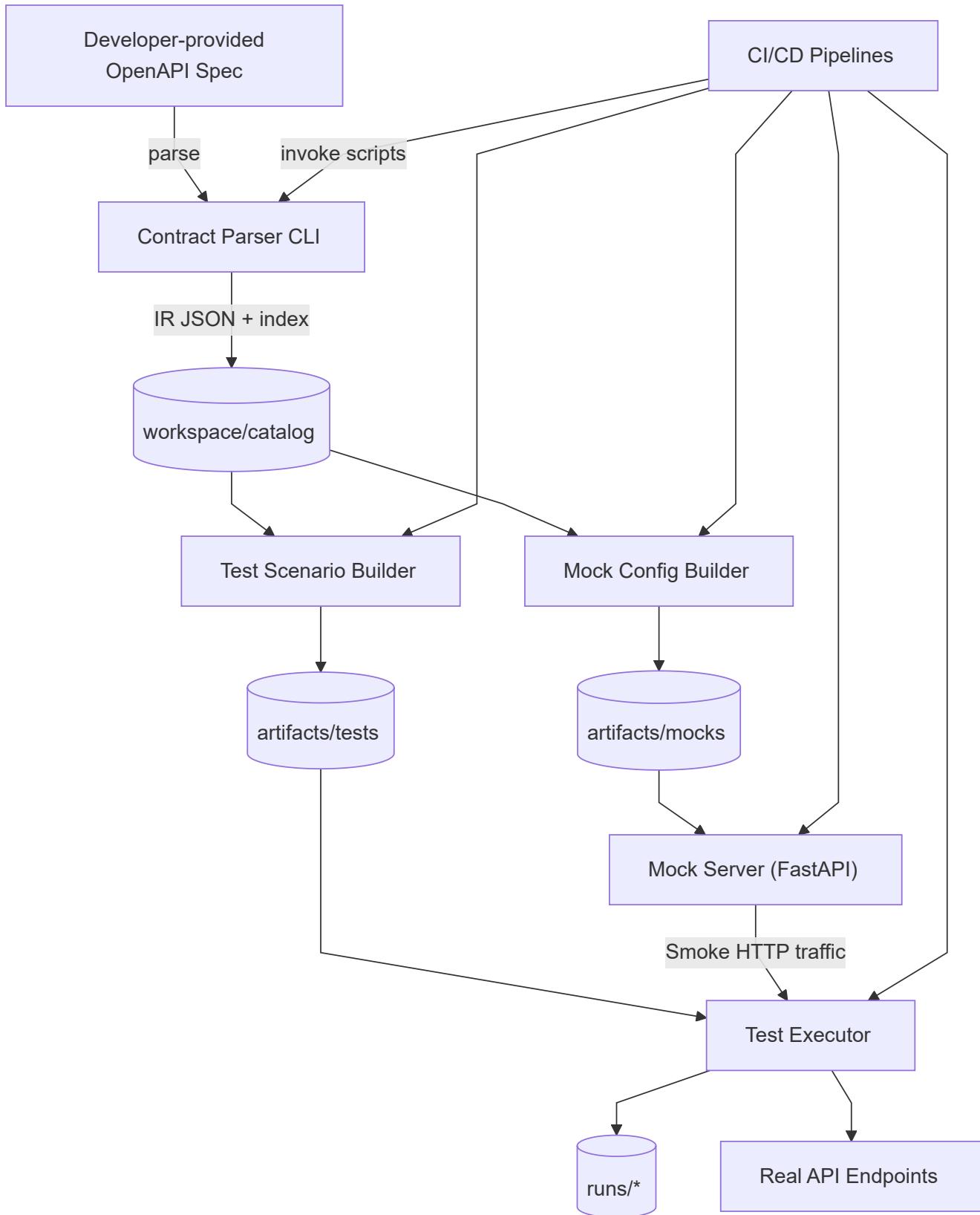
Personas and entry points

- API producers/QA use the universal PowerShell script for end-to-end runs.
- Scenario engineers invoke individual CLIs (parser, scenario builder, mock builder, executor) when tweaking specific stages.
- CI/CD systems reuse the same scripts or direct Typer commands with `CONSOLE_OUTPUT_FORMAT=plain`.

Primary artifact locations

Artifact	Description	Location
Contract IR	Normalized JSON snapshots + keyword index	<code>workspace/catalog/{service}/{version}.json</code> , <code>workspace/catalog/index.json</code>
Mock configs	FastAPI-ready YAML per service/version	<code>artifacts/ mocks/{service}/{version}/mock-config.yaml</code>
Test bundles	Scenario manifests + payloads/drivers	<code>artifacts/tests/{service}/{version}/</code>
Test results	Scenario, results, logs per run	<code>runs/{scenario}-{timestamp}/</code>

2. Architecture Overview (C4 System Context)



This view shows how OpenAPI specs flow through CLI applications residing under `apps/` and how CI/CD actors or engineers trigger them. All components share consistent logging/output behavior thanks to common utility modules (e.g., `test_executor/output_config.py`).

3. Core Components

3.1 Contract Parser

Source: [apps/contract-parser/](#)

Aspect	Details
Inputs	OpenAPI 3.0+ specs from <code>specs/*.yaml</code> (single or multiple <code>--spec</code> arguments)
Outputs	Normalized IR JSON (<code>workspace/catalog/{service}/{version}.json</code>) and keyword index (<code>workspace/catalog/index.json</code>)
Key behaviors	Validates schema, normalizes operations, auto-detects service/version, replaces FAISS with JSON keyword search
CLI	<code>uv run python apps/contract-parser/contract_parser/main.py --spec specs/payments.yaml --output-dir workspace/catalog</code>

Design notes:

- Uses Pydantic models (`contract_parser/models.py`) to enforce IR structure.
- Keyword extraction logic (see [apps/contract-parser/contract_parser/indexer.py](#)) makes IR searchable without binary deps.
- Hatch shortcuts defined in [pyproject.toml](#) allow `hatch run parse --spec ...`.

3.2 Mock Config Builder

Source: [apps/mock-config-builder/](#)

Aspect	Details
Inputs	IR JSON from catalog
Outputs	YAML mock configuration per service/version (<code>artifacts/mocks/.../mock-config.yaml</code>)
Key behaviors	Generates deterministic response templates, ports/host configuration, optional custom overrides
CLI	<code>uv run python apps/mock-config-builder/mock_config_builder/main.py --ir workspace/catalog/payments-api/1.0.0.json --output-dir artifacts/mocks --port rest=9101</code>

Highlights:

- Response templates derive from schema examples with fallbacks (see [apps/mock-config-builder/mock_config_builder/generator.py](#)).
- Supports advanced YAML for latency simulation, CORS, authentication.
- Outputs align with mock server expectations (routes, headers, bodies).

3.3 Test Scenario Builder

Source: [apps/test-scenario-builder/](#)

Aspect	Details
Inputs	Same IR JSON used by mock builder
Outputs	Scenario bundles containing <code>manifest.json</code> , test files, payloads
Key behaviors	Auto-generates request templates, validation rules, schema-driven payloads, scenario prefixes
CLI	<pre>uv run python apps/test-scenario-builder/test_scenario_builder/main.py --ir ... --output-dir artifacts/tests --scenario-prefix smoke</pre>

Notes:

- Builder organizes tests per operation and prepares metadata consumed by executor drivers (see [apps/test-scenario-builder/test_scenario_builder/builder.py](#)).
- Supports custom config files for templates and authentication flags.

3.4 Mock Server

Source: [apps/mock-server/](#)

Aspect	Details
Inputs	Generated <code>mock-config.yaml</code>
Outputs	FastAPI runtime serving deterministic responses
Key behaviors	Structured logging (rich/plain/json), route registration based on config, environment-driven output formats
CLI	<pre>uv run python apps/mock-server/mock_server/main.py --config artifacts/Mocks/payments-api/1-0-0/mock-config.yaml</pre>

Design features:

- Logging utilities in [apps/mock-server/mock_server/logging_utils.py](#) respect `CONSOLE_OUTPUT_FORMAT`.
- Shares `output_config.py` conventions with test executor to keep CLI/ENV priority consistent.
- Supports background job execution for parallel mock instances.

3.5 Test Executor

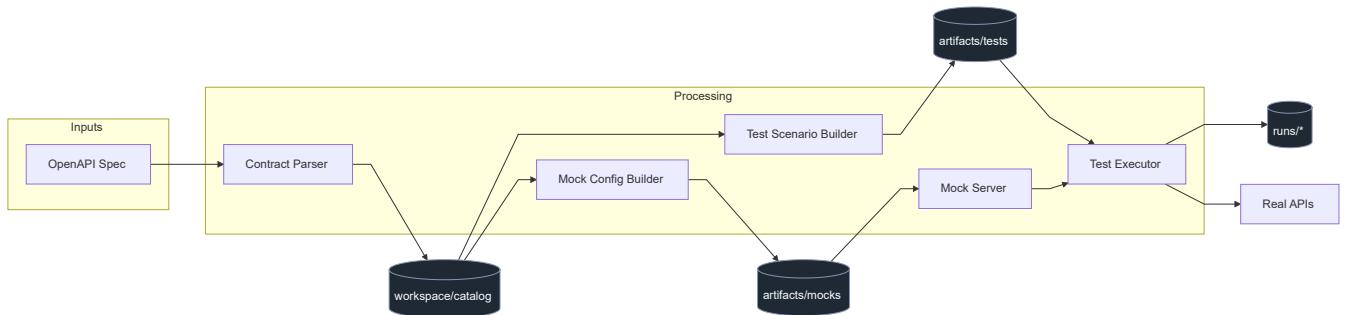
Source: [apps/test-executor/](#)

Aspect	Details
Inputs	Scenario bundle path, optional overrides (output dir, output format, base URL)
Outputs	Rich/plain/json console summaries plus <code>runs/{scenario}/results.json</code>
Key behaviors	Smart environment detection (TTY + CI env vars), progress bars (<code>rich</code>), structured JSON outputs, driver-based HTTP execution
CLI	<code>uv run python apps/test-executor/test_executor/main.py --bundle artifacts/tests/payments-api/1.0.0 --output-dir runs</code>

Implementation notes:

- `ConsoleReporter` ([apps/test-executor/test_executor/console_reporter.py](#)) handles rendering decisions.
- `runner.py` orchestrates HTTP calls via per-operation definitions in scenario files.
- Common env vars: `SMOKE_RUNTIME_BASE_URL`, `SMOKE_RUNTIME_TIMEOUT`, `CONSOLE_OUTPUT_FORMAT`.

4. Component Relationships (Mermaid Component Diagram)



This component view highlights persistent storage directories and shows that both mock and real endpoints are first-class targets for the same test bundles.

5. Tooling & Configuration Stack

Dependency management and scripts

- Managed via `uv` (`uv sync`, `uv run ...`) and Hatch (see `[tool.hatch.envs.default]` in [pyproject.toml](#)).
- Hatch scripts (`parse`, `build_mock`, `build_scenario`, `serve_mock`, `execute`, `lint`, `format`, `type_check`, `tests`) wrap common commands.

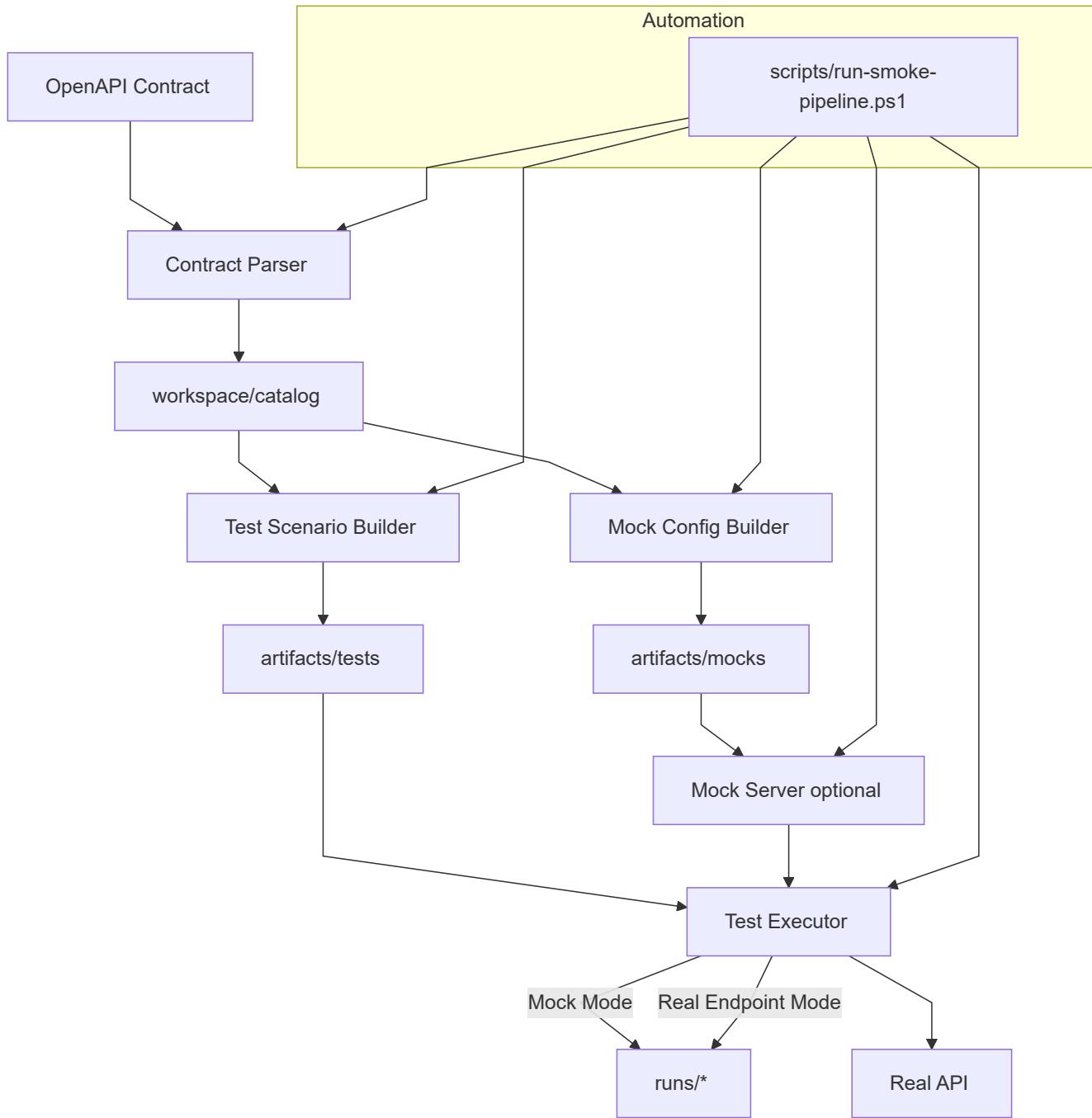
Code quality

Task	Command	Configuration
Formatting	<code>uv run ruff format apps/</code>	<code>tool.ruff</code> with 100-char lines
Linting	<code>uv run ruff check apps/</code>	Enforces E/F/I/N/W/UP rules
Type checking	<code>uv run mypy apps/...</code>	Strict mode with <code>warn_return_any</code> , <code>disallow_untyped_defs</code>
Tests	<code>uv run pytest</code>	Targets <code>apps/</code> and (future) <code>libs/</code> per <code>tool.pytest.ini_options</code>

Environment variables

Variable	Scope	Effect
<code>CONSOLE_OUTPUT_FORMAT</code>	All CLIs	<code>auto</code> (smart), <code>rich</code> , <code>plain</code> , <code>json</code>
<code>SMOKE_RUNTIME_BASE_URL</code>	Test Executor	Overrides default <code>http://127.0.0.1:9101</code> when targeting real APIs
<code>SMOKE_RUNTIME_TIMEOUT</code>	Test Executor	Request timeout (seconds)
<code>LOG_LEVEL</code> or <code>SMOKE_RUNTIME_LOG_LEVEL</code>	All	Logging verbosity

6. Workflow Deep-Dive



- Manual users can execute each Typer CLI independently (see step-by-step commands in [README.md](#) and [plans/api-first-rest-mock-workflow-example.md](#)).
- The pipeline script automates parallel runs by varying `-SpecPath`, `-RestPort`, and `-outputFormat`.

7. Execution Modes

Mode	When to use	Key commands
Automated pipeline	Full contract-to-smoke flow with zero manual interventions	<code>pwsh scripts/run-smoke-pipeline.ps1 -SpecPath specs/payments.yaml -outputFormat rich</code>
Manual CLI chain	Debugging specific stages or customizing outputs	Sequence of <code>uv run python apps/.../main.py</code> commands (parser → mock config → scenario → mock server → executor)
CI/CD	GitHub/GitLab Jenkins pipelines	Use <code>CONSOLE_OUTPUT_FORMAT=plain</code> and upload <code>runs/</code> artifacts (examples in README.md , .github/workflows/smoke-tests.yml , .gitlab-ci.yml)

The same scenario bundle can target either the local mock server or production-like endpoints by changing `SMOKE_RUNTIME_BASE_URL`.

8. Data & Observability

- **Structured logging:** `structlog` renderers configured via [mock_server/logging_utils.py](#) and shared `output_config` modules ensure consistent console/plain/json outputs.
- **Run artifacts:** Each execution writes `scenario.json`, `results.json`, and optionally `summary.txt`/`events.jsonl` under `runs/{scenario}-{timestamp}/` for traceability.
- **Mock runtime telemetry:** Logs entries such as `request_received` and `request_served` with latency metrics, enabling quick validation of contract behavior.
- **Test executor reporting:** Rich tables (interactive), plain text (CI), or JSON (automation) summarizing pass/fail counts, durations, endpoints.

9. Appendix & References

- Detailed architecture deep dive: [plans/api-smoke-architecture.md](#)
- Manual mock workflow example: [plans/api-first-rest-mock-workflow-example.md](#)
- Smoke runtime environment specifics: [plans/smoke-runtime-environment.md](#)
- Component READMEs: contract parser, mock config builder, test scenario builder, mock server, test executor (see links above)
- Scripts: [scripts/run-smoke-pipeline.ps1](#), [scripts/payments-smoke-e2e.ps1](#)

This document stays in sync with [README.md](#) and component docs; update both when introducing new tooling, artifact paths, or workflows.