



## Overview of the STAC-M1 Test Harness (v1.0)

The STAC-M1 Benchmark specifications test the ability of direct-feed solutions (a.k.a. “ticker plants”) to handle market data from exchanges or other trading venues, in a variety of configurations. The test cases emulate consumption by a small group of data-intensive trading applications such as market making or arbitrage.

The STAC-M1 specifications draw from the input of seven leading trading firms and six vendors of high-performance ticker-plant solutions and are approved by the STAC Benchmark Council ([www.STACresearch.com/council](http://www.STACresearch.com/council)).

There is currently one STAC-M1 variant defined: STAC-M1.OPRA. This test harness uses UDP-based, FAST-encoded OPRA data as its source, which it plays back at multiples of the recorded data rate while preserving the natural “micro-burstiness” of the traffic. The harness controls the watchlists, field types, and other application particulars in accordance with usage patterns that trading firms have indicated are common for automated options trading in the US. STAC-M1 specifications can be easily defined for other data feeds within the common STAC-M1 framework.

The diagram below illustrates the test setup. Recorded data plays at various rates, and the “stack under test” (SUT) is responsible for delivering normalized data to up to five test clients under various conditions, which are defined by each spec. Note that the diagram is generic and does not apply exactly to each spec (for example, some of the tests involve just one client). The test specs make no assumption about the architecture of the SUT (FPGA vs CPU, in-process library vs distributed system, Ethernet vs InfiniBand, etc.). Update latency is shown as  $\Delta t$ , which is from the availability of raw exchange data on the wire to the availability of consumable, normalized data in the test client.

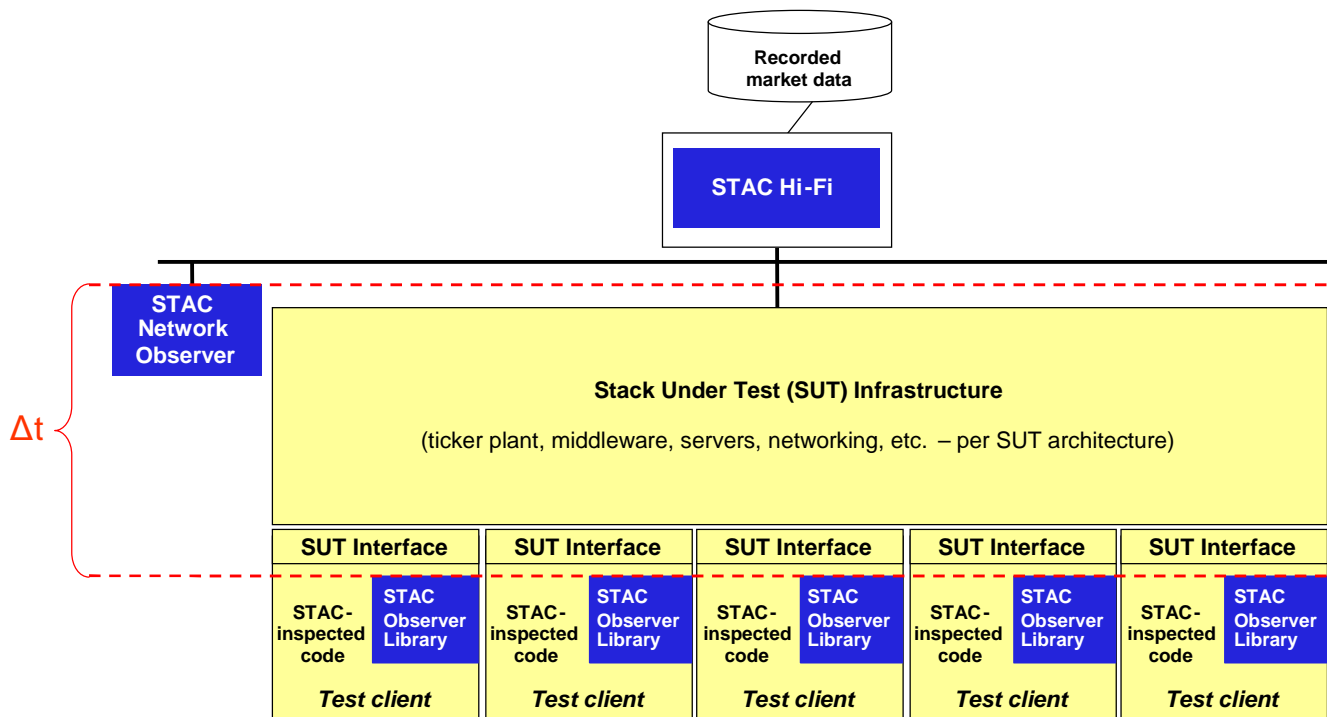


Figure 1: Abstract diagram of the STAC-M1.OPRA harness

To ensure sub-microsecond fidelity of playback and single-digit microsecond accuracy of latency measurement, the harness requires specialized hardware for packet transmission/capture and time synchronization (contact STAC for details; STAC continually reviews the state of technology that may improve cost-vs-accuracy tradeoffs). The harness also requires a few servers to host the test clients, and a server to host playback, capture, and analysis.

The Baseline Suite of STAC-M1.OPRA requires nine test sequences, outlined in Table 1. These measure latency, throughput, power efficiency, and other key performance attributes. In addition to testing the system as a whole under normal operation, the Baseline suite includes tests that isolate API performance or that test system behavior under exception conditions such as slow consumers. A subset of these (sequences 6 and 7) is a “Short Suite” that focuses on the behavior of a solution under heavy load. The Short Suite was defined in order to satisfy vendors of lower-stack technologies (e.g., servers, CPUs, etc) who wanted a basis for measuring their products’ performance without the expense of benchmarks geared more toward upper-stack behavior (API, exception handling, etc.).

Test sequence	Purpose
1	Test the client API with a moderate watchlist at moderate rates
2	Test throughput of the API with a moderate watchlist
3	Test the proportion of total watchlist a single client can handle at moderate throughput
4	Test latency with no fanout at moderate throughput
5	Test throughput of the system with a full watchlist but no fanout
6*	Test latency and resource efficiency with moderate fanout at moderate throughput
7*	Test throughput of the system with a full watchlist and moderate fanout
8	Test throughput in a system with slow consumers
9	Test the latency impact of a client restart on other clients during moderate update load

\* Sequence is part of the Short Suite.

**Table 1: Test Sequences in STAC-M1.OPRA Baseline Suite**

## Using the STAC-M1 Test Harness in your own lab

STAC Benchmark Council members who license the STAC-M1 Test Harness can run rigorous STAC-M1 tests on any system of their choosing. By comparing your results to published STAC Reports, this enables you to “mark your system to market” in the privacy of your own lab and quickly generate results for many system configurations.

The STAC-M1 Test Harness makes it simple to run tests that conform to the official STAC-M1 Benchmark specifications. By handling the details of test setup and analysis, the STAC-M1 harness allows you to spend more time understanding and optimizing the technologies that you’re testing. In addition, some components of the test harness can be used for other purposes. For example, STAC Hi-Fi allows you to record and play back any UDP-based feed at multiples of market rates, with sub-microsecond fidelity (note: performance analysis of new feeds currently requires additional code from STAC).

The STAC-M1 Test Harness package consists of:

- The latest STAC-M1 Benchmark specifications
- Standard configuration and data files required to run STAC-M1 test sequences
- Analysis tools that generate throughput and latency statistics
- Documentation for developers and testers, plus access to the online STAC-M1 Practitioner’s Forum
- Ability to use STAC Packs (pre-optimized STAC-M1 Producers and Consumers) from participating vendors
- STAC Observer Library (‘C’) with Developers Guide, API Reference Manual, and example code that enable you to create test clients for any proprietary or off-the-shelf solution. (Ask STAC for supported compilers and platforms.)

***For more information, please contact [council@STACresearch.com](mailto:council@STACresearch.com).***