NEST: Network Enforced Session Types (Artifact)

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Abstract

This artifact contains NEST: a tool for synthesizing network-level runtime monitors from application-level protocols specified as session types. More specifically, NEST takes as input one or more session types, and generates (1) a set of table entries to be uploaded on network switches that support the P4 standard, and (2) a Python API allowing applications to send/receive messages that carry the packet headers required for the network-level monitoring to work. This artifact also contains the code for reproducing the examples and measurements in the companion paper.

2012 ACM Subject Classification Software and its engineering → Software verification

Keywords and phrases Session types, runtime verification, P4, programmable data planes.

Digital Object Identifier 10.4230/DARTS.12.1.2

Funding Research partially supported by: the DTU Nordic Five Tech Alliance grant "Safe and secure software-defined networks in P4"; the Horizon Europe grant no. 101093006 "TaRDIS"; and the Independent Research Fund Denmark project "Hyben." The work of Amir was partially supported by a Rothschild Fellowship from Yad Hanadiv (The Rothschild Foundation).

Related Article Jens Kanstrup Larsen, Alceste Scalas, Guy Amir, Jules Jacobs, Jana Wagemaker, and Nate Foster, "NEST: Network Enforced Session Types", in 40th European Conference on Object-Oriented Programming (ECOOP 2026), LIPIcs, Vol. 372, pp. 17:1–17:31, 2026.
`https://doi.org/10.4230/LIPIcs.ECOOP.2026.17`

Related Conference 40th European Conference on Object-Oriented Programming (ECOOP 2026), June 29–July 3, 2026, Brussels, Belgium

Evaluation Policy The artifact has been evaluated as described in the ECOOP 2026 Call for Artifacts and the ACM Artifact Review and Badging Policy.

1 Scope

This artifact supports the claims made in Section 5 of the companion paper, which altogether describe the correctness and effectiveness of NEST. More specifically, the artifact aims to replicate the following results:

1. The bar plots shown in Figure 13 and Appendix C;
2. The time series shown in Figure 14;
3. The statistics shown in Table 2.

2 Content

The artifact consists of the following directories:

- `nest/`, which further contains:
  - `nest_scala`, containing the Scala 3 implementation of NEST itself (which performs the synthesis from session types to table entries and API generation) as well as the session types and NEST instantiation of each example described in the paper;
  - `nest_p4`, containing the P4 switch configuration files that are deployed on P4-enabled switches. These files set up the P4 tables that are then populated by NEST-generated entries that enforce session monitoring;
  - `nest_python`, containing library files for the NEST generated session API.
- `examples/`, which contains subdirectories with network configurations for Mininet and the Python implementation of each role in each example (using the NEST-generated session APIs).
- `testing/`, which contains support files for running the artifact evaluation, summarizing results, and generating plots.
- `vm/`, which contains the artifact virtual machine (as an Open Virtual Appliance (OVA) package) as well as support files for generating the VM image using Vagrant.[1]

More details can be found in the files `README.md` and `DOCUMENTATION.md` included in the artifact.

3 Getting the artifact

The artifact endorsed by the Artifact Evaluation Committee is available free of charge on the Dagstuhl Research Online Publication Server (DROPS).

4 Tested platforms

The artifact includes a virtual machine available both as a ready-to-import Open Virtual Appliance (OVA) package, or as a Vagrant file. The VM is configured with a 2-core x86-64 processor and 2 GB of RAM. It has been tested on hosts with:

- Ubuntu 22.04, 24.04, or 25.10;
- x86-64 CPUs with 4 or 8 cores;
- 16 or 32 GB of RAM.

Any host machine with specifications higher to those of the VM above (2-core x86-64 processor and 2 GB of RAM) should be sufficient to run the artifact without major issues. The artifact has no known compatibility issues.

5 License

NEST and the scripts for reproducing the results in the companion paper are licensed under the MIT License.[2] The artifact includes a VM with a pre-installed Ubuntu-based Linux distribution: the open source licenses of its software packages are available in the files `/usr/share/doc/*/copyright` in the VM itself.

[1] `https://developer.hashicorp.com/vagrant`
[2] `https://opensource.org/licenses/MIT`

6 MD5 sum of the artifact

e84ebecffe57c56bc7b76fda065f6e5d

7 Size of the artifact

5.0 GB

A Reproducing results

Please see the file `README.md` included in the artifact.