

Bachelor’s Thesis: Performance-Analysis of VPP

Intermediate Talk

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VPP: a fast software router

VPP (Vector Packet Processing) is a user-space software router. This approach combines many advantages:

- ▶ deployable to usual architectures
- ▶ fast user-space network interface drivers
- ▶ can run in virtualized containers

"It is the open source version of Cisco’s Vector Packet Processing (VPP) technology." [1] Now it is being developed by FD.io ("The Fast Data Project") which belongs to the Linux Foundation.

Feature Highlights:

- ▶ vectorized processing of packets in badges
- ▶ utilizes high-speed dpdk drivers
- ▶ modular and extendable packet-processing graph
- ▶ cpu-scalability

Testing Methodology

MoonGen [3] is scripted to generate testing load according to the following testing parameters:

- ▶ packet rate
- ▶ packet size
- ▶ traffic type (generic Ethernet, UDP)
- ▶ traffic pattern (inter packet gaps)

Gathered testing results:

- ▶ latency histogram
- ▶ throughput
- ▶ linux perf stats (cache misses...)
- ▶ linux perf record (cpu-time spent per symbol)
- ▶ internal vpp state information

For tests to return meaningful results, the optimum of throughput to latency is being found by a script. This packet rate is then used for further tests. Otherwise the results are inaccurate, because of utilization of the packet buffer. VPP properties to test:

- ▶ raw forwarding throughput
- ▶ latency: cache and memory impact
- ▶ processing graphs utilizing multiple processing nodes / specific processing nodes

Measurement setup

Background

- ▶ Important background for this work
- ▶ may be some things about related work or important libraries/frameworks used

Measurement Setup:

- ▶ How does your setup look like (maybe a figure)?
- ▶ What are the relevant questions you try to answer with your measurement?
- ▶ What do you measure?
- ▶ How do you measure?

Benchmarking Setup

The diagram illustrates the benchmarking setup. It shows a 'kaunas: pos-tools' box on the left connected to a 'Load Generator' box. The 'Load Generator' is connected to 'NIC1' and 'NIC2' of a 'MoonGen' box. 'NIC1' and 'NIC2' are connected to 'NIC1' and 'NIC2' of a 'VPP' box. The 'VPP' box contains 'DPDK', 'I2-input', and 'I2-forward' components, and is labeled 'multiple cores'. The 'VPP' box is connected to a 'Device under Test' box. A 'perf tools' box is connected to the 'Load Generator' and the 'VPP' box, leading to 'Performance Reports'.

Additional data

MoonRoute achieves superior performance to a number of different software routers (tested with a single routing entry on the same hardware):

Router	Mpps	Relative
MoonRoute	14.6	100%
FastClick (DPDK 2.2) [3]	10.4	72%
Click (DPDK 2.2) [3]	4.3	29%
Linux 3.7	1.5	10%

Planned Schedule

Short time schedule for the upcoming weeks:

- ▶ Official start date: October 15, 2010
- ▶ Official end date: February 15, 2011
- ▶ Weeks left: 8

Schedule

- ▶ Week 1-4: Providing cookies for I8
- ▶ Week 5-6: Perform additional measurements
- ▶ Week 7: Writing thesis
- ▶ Week 8: **Several** corrections passes
- ▶ Week 9: Print and hand-in

[1] What is vpp? [https://wiki.fd.io/view/VPP/What\\_is\\_VPP%3F](https://wiki.fd.io/view/VPP/What_is_VPP%3F). Accessed on 2019-01-16.

[2] L. Braun, A. Didebulidze, N. Kammenhuber, and G. Carle. Comparing and Improving Current Packet Capturing Solutions based on Commodity Hardware. In *Internet Measurement Conference 2010 (IMC'10)*, Melbourne, Australia, Nov. 2010.

[3] P. Emmerich, S. Gallenmüller, D. Raumer, F. Wohlfart, and G. Carle. MoonGen: A Scriptable High-Speed Packet Generator. In *Internet Measurement Conference 2015 (IMC'15)*, Tokyo, Japan, Oct. 2015.

[4] P. Emmerich, D. Raumer, F. Wohlfart, and G. Carle. A Study of Network Stack Latency for Game Servers. In *Proceedings of the 13th Annual Workshop on Network and Systems Support for Games*, Dec. 2014.

[5] S. Günther, M. Riemensberger, and W. Utschick. Efficient GF Arithmetic for Linear Network Coding using Hardware SIMD Extensions. In *Proceedings of the International Symposium on Network Coding (NetCod)*, Aalborg, Denmark, June 2014.