Chair of Network Architectures and Services
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# 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 architechtures
- 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 beeing developed by FD.io ("The Fast Data Project") which belongs to the Linux Foundation.
Feature Highlights:

- vecorized 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 beeing 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 m
- specific processing nodes /

## Measurement setup

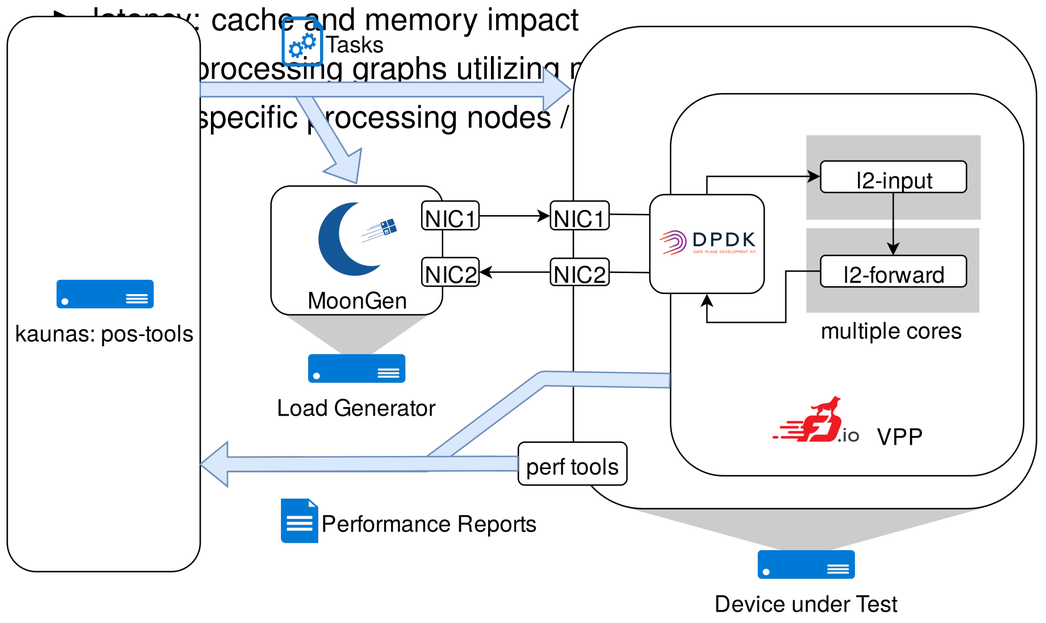
### Background

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

Measurment 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




## I2 Throughput

Testing VPP with non-ip ethernet packets on an Intel E5-2640 @ 2.0GHz (cesis) with 10G networking results in the following numbers:

| VPP config | max Mpps | stable Mpps | Relative |
|---|---|---|---|
| packet gen speed | 14.86 | 14.86 | 100% |
| l2 xconnect | 10.4 | 10.1 | 68% |
| l2 bridge: no features | 9.35 | 9.2 | 62% |
| l2 bridge: mac-age | 8.62 | 8.6 | 58% |
| l2 bridge: mac-learn | 8.51 | 8.3 | 56% |
| l2 bridge: mac-learn, mac-age | 8.50 | 8.3 | 56% |

| 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. 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.