Bachelor's Thesis: Performance-Analysis of VPP
Intermediate Talk

Presenter: Peter Okelmann— *Advisors:* Paul Emmerich, Dominik Scholz— *Supervisor:* Prof. Dr.-Ing. Georg Carle

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
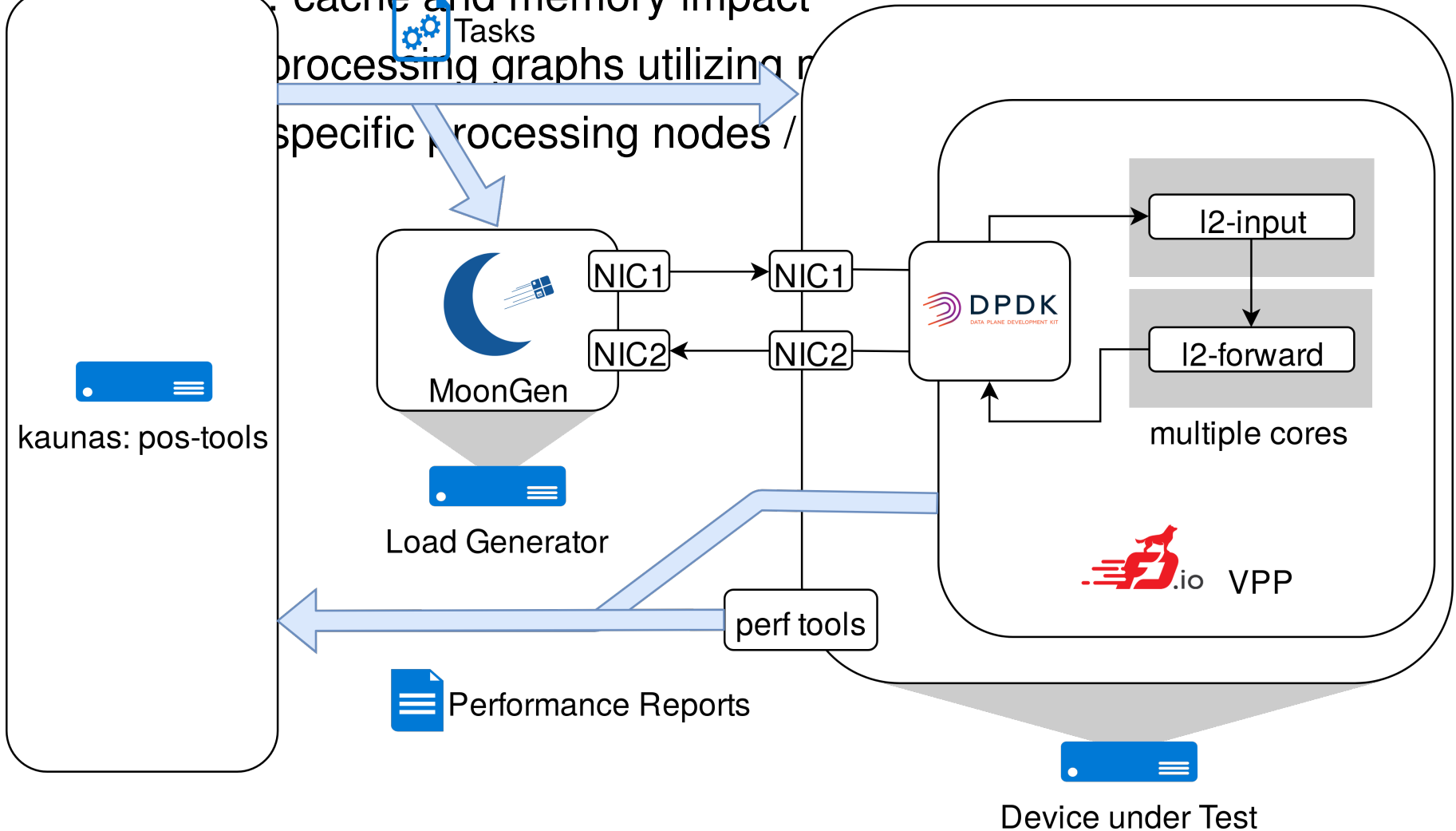
► cpu-scalability

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?

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 multiple cores / specific processing nodes /

Benchmarking Setup

l2 Throughput

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

VPP config	max Mpps	good 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%
Click (DPDK 2.2) [3]	10.4	72%
	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 l8

► 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.