Internship 2022 - Benchmarking eBPF based solutions

Project Name: XDP performance studies for cloud-native NFV Usecases
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Tenure: 6 Months (Start- 9 June 2022)

Tasks and Progress:

S. No	Task	Week	Related Links	Outcomes	Status
1	Setup VPP(Vector Packet Processing) and run Trex Traffic Gen to benchmark it.	week 1 & 2	https://medium.com/@shivank1128/vpp-benchmark-with-trex-traffic-generator-6cfcecb931a9	Learned the following: 1) How to attach and De-attach NIC from DPDK. 2) How to benchmark with Trex Traffic gen.	Completed
3	Setup Open Virtual Switch and create a loopback between interfaces, benchmarking it with Trex.	Week 3	http://solomon.ipv6.club.tw/Course/SDN/howto_install_ovs_on_centos7.html https://www.linuxtechi.com/install-use-openvswitch-kvm-centos-7-rhel-7/ https://access.redhat.com/documentation/en-us/red_hat_openstack_platform/10/html-single/ovs-dpdk_end_to_end_troubleshooting_guide/index	1) Installed OVS on Node4. 2) Created loopback interface.	Completed
4	Upgrade Node4 from Centos 7 to Fedora 36. or any suitable Operating System to Run eBPF programs.	Week 4 & 5	https://getfedora.org/en/workstation/download/	1) Removed Centos 7 from Node 4 POD12. 2) Tried to install fedora 36 via Redirect ISO (Failed: due to some issue in Jviewer) 3) Got POD 18 (Ubuntu 20) for testing eBPF programs.	Completed
5	Attach an eBPF program to Kernel and Benchmark it with Trex.	Week 6 & 7	https://github.com/Nat-Lab/xdp-router (Solution XDP Bridge) https://github.com/xdp-project/xdp-tutorial https://github.com/torvalds/linux/tree/master/samples/bpf https://docs.cilium.io/en/latest/bpf/ https://github.com/dpino/xdp_ipv6_filter	1) Tested 3 XDP bridges but rejected them due to many bugs and errors. 2) Compiled and Attached the XDP router to the interface. 3) testing the program (Whether fulfilling the requirements or not). (In Progress)	Completed
6	Waiting for Pod12 Node4 to get ready, depends on infra team!	Week 8 & 9			Completed
7	Automate setting up eBPF programs for Baremetal usecases- similar to OVS-DPDK/VPP.	Week 10	ViNePerf Nile Release Planning		Completed

Due to some VPN connectivity issues to POD12.

Proceeding with the following tasks first.
Source Code For Following Tasks: https://github.com/Alt-Shivam/Benchmarking-eBPF-XDP

		Status
eBPF Based Bridge	Complete lifecycle; including automation Install, start, configure (add interfaces, add forwarding rules)	Completed https://github.com/Alt-Shivam/eBPF
Tgen: PROX	Complete Lifecycle: Install, Start, start-test, analyse results	Completed
Tgen: T-REX	Complete Lifecycle: Install, Start, start-test, analyse results	Completed https://github.com/Alt-Shivam/Benchmarking-eBPF-XDP/tree/main/Tgen:%20TREX
FWD: DPDK-Apps (l2fwd, L3fwd, ..)	Complete Lifecycle: Install, Start, collect metrics	Completed https://github.com/Alt-Shivam/Benchmarking-eBPF-XDP/tree/main/FWD:%20DPDK-Apps(L2%2CL3)

FWD: PROX FWD: VPP	Complete Lifecycle: Install, Start, collect metrics	Completed https://github.com/Alt-Shivam/Benchmarking-eBPF-XDP/tree/main/FWD:%20VPP%2C%20PROX
CNI: Cilium	Complete lifecycle; including automation Install, start, configure (add interfaces, add forwarding rules)	Completed https://github.com/Alt-Shivam/Benchmarking-eBPF-XDP/tree/main/CNI:%20Cilium
CNI: eBPF-Calico (if time permits)	Complete lifecycle; including automation Install, start, configure (add interfaces, add forwarding rules)	Completed
K8S Reference Definitions: (a) POD defns. (b) Network Attachment [CNI: Cilium]	(a) https://github.com/opnfv/vineperf/tree/master/tools/k8s/reference-definitions/pod-defs (b) https://github.com/opnfv/vineperf/tree/master/tools/k8s/reference-definitions/network-attachments	Completed

Some Important links for Centos 7:
https://linuxhint.com/install_llvm_centos7/
https://stackoverflow.com/questions/44219158/how-to-install-clang-and-llvm-3-9-on-centos-7

Learning Resource Section:

[VSperf] Testbed.pdf

Week 1.pdf

LFN-eBPF XDP.pdf

Node 5

10.10.124.25 ens801f0
3c:fd:fe:b4:41:08, 81:00.0

10.10.122.25 ens801f1
3c:fd:fe:b4:41:09, 81:00.1

10.10.24.53 eno3
00:1e:67:fd:f8:50, 02:00.0

10.10.24.54 eno4
00:1e:67:fd:f8:51, 02:00.1

10.10.24.55 eno5
90:e2:ba:8b:9a:d8, 06:00.0

10.10.24.56 eno6
90:e2:ba:8b:9a:d9, 06:00.1

Tgen Node

Node 4

eno3   10.10.124.24
00:1e:67:fd:ee:08, 02:00.0

eno4   10.10.122.24
00:1e:67:fd:ee:09, 02:00.1

ens801f0   10.10.24.40
3c:fd:fe:b4:40:48, 81:00.0

ens801f1   10.10.24.41
3c:fd:fe:b4:40:49, 81:00.1

eno5, 06:00.0,
90:e2:ba:84:0a:f4

eno6, 06:00.1,
90:e2:ba:84:0a:f5

ens801f2   10.10.24.42
3c:fd:fe:b4:40:4a, 81:00.2

ens801f3   10.10.24.43
3c:fd:fe:b4:40:4b, 81:00.3

Worker, DUT Node

H/W TGen

Port-1

Port-2

Port-3

Port-4

node3

Port-5

Port-6

Port-7

Port-8

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Node 1

eno3   10.10.124.24
00:1e:67:f8:57:88,
02:00.0

eno4   10.10.122.24
00:1e:67:f8:57:88,
02:00.1

ens785f0 10.10.24.40
90:e2:ba:4a:82:40
06:00.0

ens785f1 10.10.24.41
90:e2:ba:4a:82:40,
06:00.1

Worker, DUT Node

Node 2

ens785f0
90:e2:ba:bf:79:b0,
06:00.0

Ens785f1
90:e2:ba:bf:79:b1,
06:00.1

eno3
00:1e:67:fd:f8:38,
02:00.0

eno4
00:1e:67:fd:f8:39,
02:00.1

Master, Tgen Node