More Microbenchmark Results for FastPath

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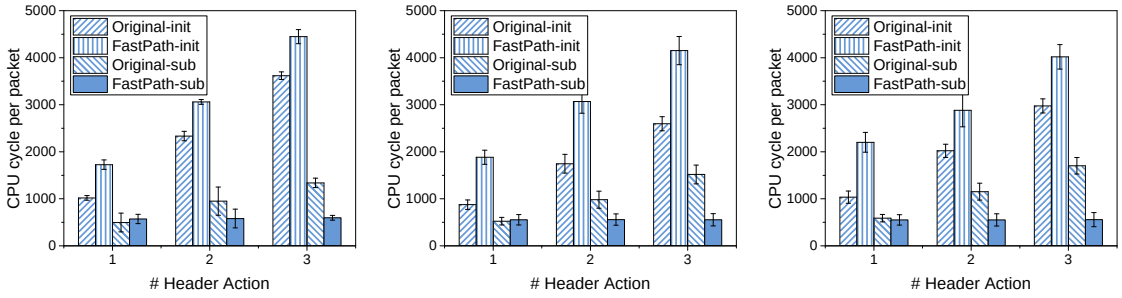
We present the complete microbenchmark results for FastPath paper. Due to page limit in our SIGCOMM 2018 submission, we could not provide the entire results and just used IPFilter as an example (§7.1 in FastPath paper). Our argument is that the results of IPFilter are representative and comparable to other NFs we implemented (e.g., Maglev and MazuNAT). Hence, we provide the complete microbenchmark results for header action consolidation in this short technical report. Our FastPath system is implemented on BESS [1] and OpenNetVM [2], both of which are popular NFV platforms. Therefore, all microbenchmarks are performed on the two platforms. The NFs that we use in this paper are MazuNAT, IPFilter, Maglev Load Balancer.

1 Microbenchmark

We vary the number of header actions to evaluate how consolidating them saves CPU cycles for processing. We use a chain with 1-3 identical NF. The NFs we choose for this evaluation are IPFilter, MazuNAT and Maglev, because all the three NFs do not have state function in our implementation. We plot the results of the CPU cycle per packet on BESS and OpenNetVM in Figure 1 and Figure 2, respectively.

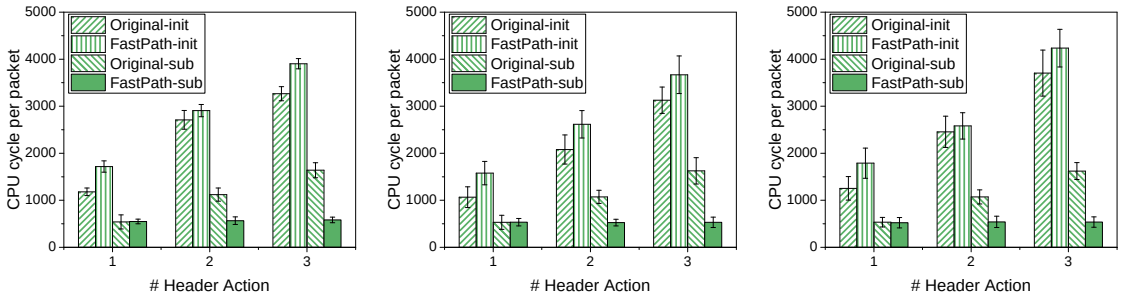
As shown in Figure 1, for both chains w/ and w/o FastPath, the initial packet needs to spend much more processing cycles than subsequent packets due to the initialization processes (e.g., linear matching of ACL lists for new flows). For subsequent packets, when there is only one header action, FastPath costs more processing cycles than the original chain, due to the extra overhead for recording the processing rules into the Local MAT. When the number of header actions increases to 2 and 3, consolidation reduces 40.9% and 57.7% CPU cycles than original chain for IPFilter; for MazuNAT, consolidation reduces 43.2% and 63.5%; for Maglev, the reduction are 48.4% and 66.0%.

Similarly, Figure 2 shows the CPU cycle reduction for chains w/ and w/o FastPath. When the number of header action increases to 2 and 3, the CPU cycle reduction reaches 49.3% and 64.5% for IPFilter; for MazuNAT, consolidation reduces 47.9% and 62.3%; for Maglev, the reduction are 48.5% and 64.8%.



(a) IPFilter on BESS (b) MazuNAT on BESS (c) Maglev on BESS

Figure 1: Effect of header action consolidation on BESS.



(a) IPFilter on BESS (b) MazuNAT on BESS (c) Maglev on BESS

Figure 2: Effect of header action consolidation on OpenNetVM.

References

[1] Han, S., Jang, K., Panda, A., Palkar, S., Han, D., and Ratnasamy, S. Softnic: A software nic to augment hardware. *Dept. EECS, Univ. California, Berkeley, Berkeley, CA, USA, Tech. Rep. UCB/EECS-2015-155* (2015).

[2] Zhang, W., Liu, G., Zhang, W., Shah, N., Lopreiato, P., Todeschi, G., Ramakrishnan, K., and Wood, T. Opennetvm: A platform for high performance network service chains. In *Proceedings of the 2016 workshop on Hot topics in Middleboxes and Network Function Virtualization* (2016), ACM, pp. 26–31.