Week16

Each NOX instance can handle about 30k flow installs per second. However, it can typically process a far larger number of events which do not trigger an interaction with a switch. Events published through HyperFlow only affect controller state and should not trigger any interaction with controllers. Therefore, using HyperFlow, network operators can easily add more controllers to handle more flow initiation events while keeping the flow setup latency minimal. Since in HyperFlow controllers’ operations do not depend on other controllers, they continue to operate even under heavy synchronization load. However, as the load increases, the window of inconsistency among controllers grows (i.e., the time it takes to have the views converge).

To find the number of events that HyperFlow can handle while providing a bounded inconsistency window among controllers, we benchmarked WheelFS independently to find the number of 3-KB sized files (sample serialized datapath join event using the XML archive4) we can write (publish) and read. For that, we instrumented the HyperFlow application code to measure the time needed to read and deserialize (with eventual con- sistency), as well as serialize and write (write locally and don’t wait for synchronization with replicas) 1000 such files. We ran each test 10 times and averaged the results. HyperFlow can read and deserialize 987, and serialize and write 233 such events in each second. The limiting factor in this case is the number of reads, because multiple controllers can publish (write) concurrently.

Based on the above analysis, assuming adequate control bandwidth, HyperFlow can guarantee a bounded window of inconsistency among controllers, if the net- work changes trigger less than around 1000 events per second (i.e., total of 1000 switch and host joins and leaves, and link state changes). We may be able to improve HyperFlow’s performance by modifying WheelFS (whose implementation is not mature yet) or designing an alternative publish/subscribe system. Finally, we note that HyperFlow can gracefully handle spikes in network synchronization load without losing any events, however in that period the controller views converge with an added delay.