Week 9 research note

This week I learn about Logically Centralized Architectures called ONIX.

ONIX is a distributed control plane that contains a cluster of one or more physical servers; each one may run multiple ONIX instances.

To understand how ONIX works, we should grasp its role in the network and the utility of its API.

A network controlled by ONIX has four components: first, the physical infrastructure, which includes all the network switches and routers, and other network devices, such as load balancers and firewalls. ONIX interacts with the physical infrastructure by reading and writing the state controlling of each element, for example, the forwarding table entries, second, the connectivity infrastructure, which is the communication between the physical network and ONIX, third, the control logic that relies on the top of ONIX’s API. It controls the desired network behavior, and, fourth, ONIX, which is responsible for giving the control logic programmatic access to the network.

The ONIX API is a useful API developed for network control. It allows control applications to read and write the state of any element in the network. It is a data model that represents the entire network infrastructure, with each network element corresponding to one or more data objects. The control logic, already defined, can read the current state of each object. Each copy of the network state of an object that is related to a network element is stored in the Network Information Base, NIB. This NIB is a graph that contains all the network entities. Also, network applications are implemented by reading and writing to the NIB, while ONIX distributes the NIB data between multiple running instances.

ONIX provides three methods to improve the scalability of its network. First is by partitioning the network logically, in other words, by distributing the workload on multiple ONIX instances. Second, ONIX can allow multiple nodes to show up as a single node in the upper layer, which is called aggregation. Third, ONIX allows data state applications that can be used to improve the consistency and the durability of the network.

ONIX provides a scenario where we can experience the scalability of the network: a network with a modest number of switches that can be easily managed by a single ONIX instance. The authors found that the control logic can record all forwarding information from the switches. Also, it can coordinate all the data and share them on the multiple instances.

The main results of the evaluation study of ONIX have found that, thanks to the partitioning process, ONIX can partition the workload over multiple ONIX instances. So, in case there is an overhead inside an ONIX instance, already assigned switches can be reassigned to another ONIX instance.