Research note 10

This week I learn about Logically Centralized Architectures called Hyperflow.

HyperFlow is an application developed on the top of the NOX controller, to enable logically centralized multicontroller architectures.

The HyperFlow-based network contains three parts: a control layer, a forwarding layer, and an application layer. The control layer contains multiple NOX controllers that are working cooperatively. In the forwarding layer, the switches are connected to the nearest controller. However, a switch can be reassigned to another controller in case of failure.

To propagate information in the control plane, HyperFlow uses a “publish/subscribe” messaging paradigm. This system aims to provide a guaranteed event delivery. It is also responsible for keeping the ordering of events published by the same controller. Also, it minimizes the traffic required for intercontrollers to have less overhead.

This “publish/subscribe” system runs on the top of WheelFS, a distributed file system that delivers flexible wide area storage for distributed application. It permits the applications to have more control over the control plane.

In a HyperFlow-based network, we find three channels to permit interaction between the different components: the data channel, the control channel, and the controller channel.

The controllers publish and subscribe to all of them. OpenFlow commands are published only on the controller channel, which is also used to prevent failures inside the network. The data and the control channel are mainly used to execute the publish/subscribe system to permit communication intercontrollers.

A large number of network events request only some types of services, like routing. The global network view is not affected by the changing order of arriving events or those that target the same switch. In some cases, when the network is not able to identify the events that might change the network’s state, HyperFlow can implement state synchronization among applications running on the top of the controllers to resolve the problem.