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The minimalism and simplicity in the Internet’s de- sign has led to an enormous growth and innovation atop, yet the network itself remains quite hard to change and surprisingly fragile and hard to manage. The root cause of these problems is the overly complicated control plane running on top of all switches and routers throughout the network. To alleviate this problem, previous works propose to decouple the control (decision making) and data (packet forwarding) planes, and delegate the control functionality to a logically centralized controller. This separation significantly simplifies modifications to the network control logic (as it is centralized), enables the data and control planes to evolve and scale independently, and notably decreases he cost of the data plane elements. In particular, OpenFlow has succeeded in attracting commercial vendors.

The initial design and implementation of OpenFlow assumed a single controller for the sake of simplicity. However, as the number and size of production net- works deploying OpenFlow increases, relying on a single controller for the entire network might not be feasible for several reasons. First, the amount of control traffic destined towards the centralized controller grows with the number of switches. Second, if the network has a large diameter, no matter where the controller is placed, some switches will encounter long flow setup latencies. Finally, since the system is bounded by the processing power of the controller, flow setup times can grow significantly as demand grows with the size of the net- work. Figure 1(a) illustrates these issues in a sample OpenFlow-based network.

a distributed event-based control plane for OpenFlow, which allows network operators deploy any number of controllers in their net- works. HyperFlow provides scalability while keeping network control logically centralized: all the controllers share the same consistent network-wide view and locally serve requests without actively contacting any remote node, thus minimizing the flow setup times. Additionally, HyperFlow does not require any changes to the OpenFlow standard and only needs minor modifications to existing control applications. HyperFlow guarantees loop-free forwarding, and is resilient to network partitioning as well as component failures. Besides, it enables addition of administrative areas to OpenFlow to interconnect independently managed OpenFlow areas.