

# Optimized SDN Controller Placement Strategy in Edge Networks



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## Background

The bottleneck in wireless channels makes it difficult to apply SDN centralized control in edge networks. To deal with this, one approach is to place multiple controllers in the network. The locations of controllers are crucial in this context, which we model as edge controller placement problem (ECP). We concern following challenges:

- **Resource constrained edge nodes:** Edge devices may have limited calculating power and storage. Some nodes may not be eligible to hold a controller.
- **Delay of network management:** Wireless links are relatively unstable and low-rate, causing a higher delay between a node and the controller assigned to it. Multi-hop connections may incur even larger latency.
- **Overhead of control message:** In addition to OpenFlow messages between controllers and data plane nodes, multiple controllers require synchronization. Both types of traffic may have large overheads.

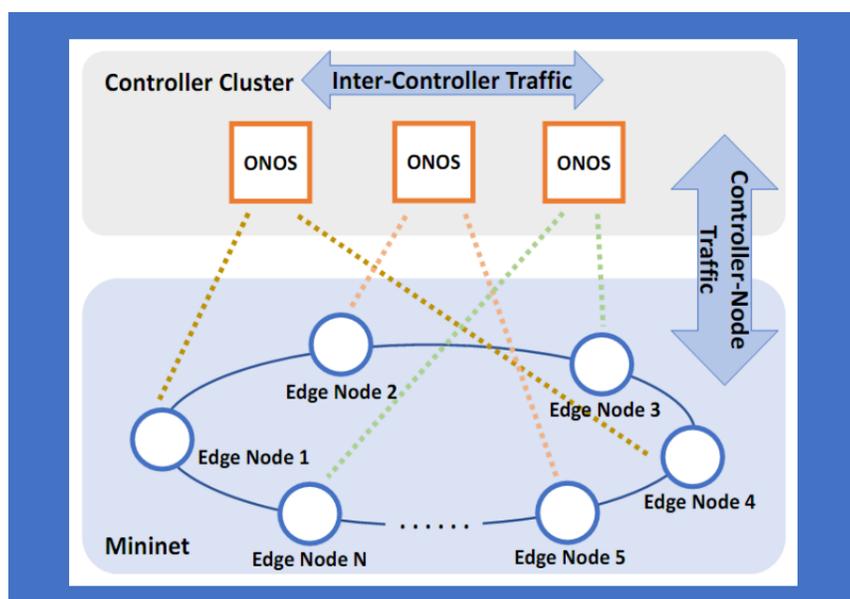


Figure 1: An edge network with multiple SDN controllers

## Result

We present following results addressing on ECP problem:

- We model ECP problem based on measured results, then proposed both an optimal solution and a scalable approximate algorithm with good performance in practical.
- We consider two types of traffic, the controller-node overhead and inter-controller overhead. We point out the trade-off between these two costs. The proposed algorithm permits operator to favor one over another.
- We deploy state-of-the-art SDN controller, ONOS, and a large-scale virtual network to implement the algorithm and verify our theoretical results. We also configure real mobile devices and wireless channels to demonstrate the feasibility of applying SDN in edge networks.

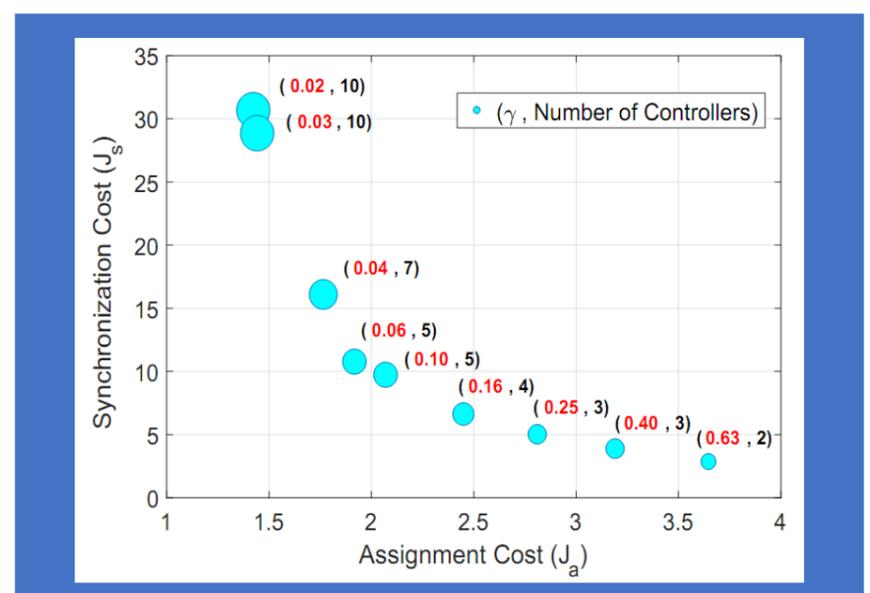


Figure 2: Optimization and trade-off between different types of costs

Q. Qin, K. Poularakis, G. Iosifidis, L. Tassiulas, "SDN Controller Placement at the Edge: Optimizing Delay and Overheads", IEEE Infocom, 2018.