Bo Liu, Ming Chen, Bo Xu, Hui Hu, Chao Hu, Qing-yun Zuo, Chang-you Xing, 2016. An OpenFlow-based performance-oriented multipath forwarding scheme in datacenters. *Frontiers of Information Technology & Electronic Engineering*, **17**(7):647-660. http://dx.doi.org/10.1631/FITEE.1601059

An OpenFlow-based performance-oriented multipath forwarding scheme in datacenters

Key words: Datacenter network, Traffic engineering, OpenFlow, Multipath transmission

Contact: Bo Liu
E-mail: lbo.xidian@163.com
 ORCID: http://orcid.org/0000-0003-2789-7201

Motivation

- Although dense interconnection datacenter networks (DCNs) (e.g., FatTree) provide multiple paths and high bisection bandwidth for each server pair, the widely used single-path Transmission Control Protocol (TCP) and equal-cost multipath (ECMP) transport protocols cannot achieve high resource utilization due to poor resource excavation and allocation.
- OpenFlow can enhance the instant management and provide fine-grained control on network resource allocation owing to the centralized control mechanism, but current OpenFlow-based schemes still have a wide performance gap compared with the optimal due to poor resource excavation and allocation.

Main idea

- OpenFlow can obtain more precise resource information of the network with shorter polling period. We introduce dynamic polling period mechanism, which chooses an appropriate polling period according to CPU utilization of the controller to obtain more fine-grained network information.
- OpenFlow adopts the centralized control mechanism and thus can execute globally optimal resource allocation. We introduce PMPT algorithm in resource allocation to maximize the network throughput.
- Without any modification on switches or end hosts, the proposed scheme can be easily deployed in DCNs.

Method

1. Introduce dynamic polling period adjustment algorithm that can make full use of controller's power to obtain more fine-grained network information without impairing the controller functions.
2. Design the performance-oriented multipath transmission mechanism (PMPT) and related resource allocation algorithm to improve the resource utilization of DCNs.
3. Carry out various experiments based on the proposed scheme.

Major results

- Our scheme can obtain higher network throughput compared with existing schemes.

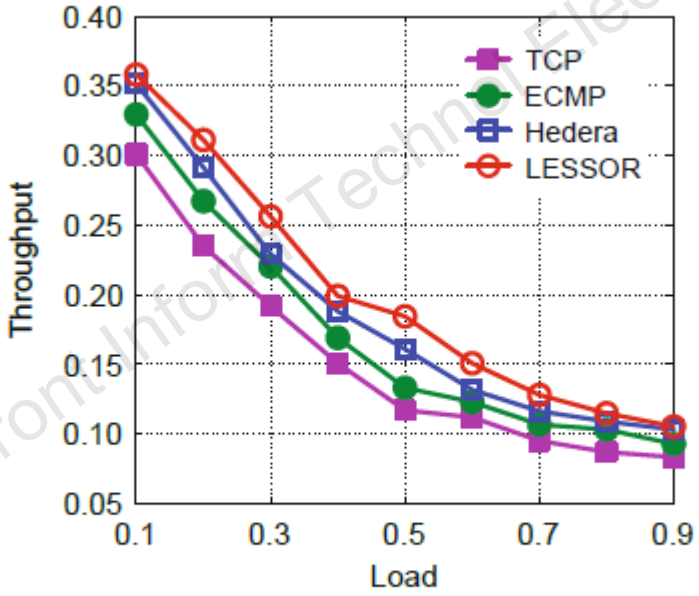
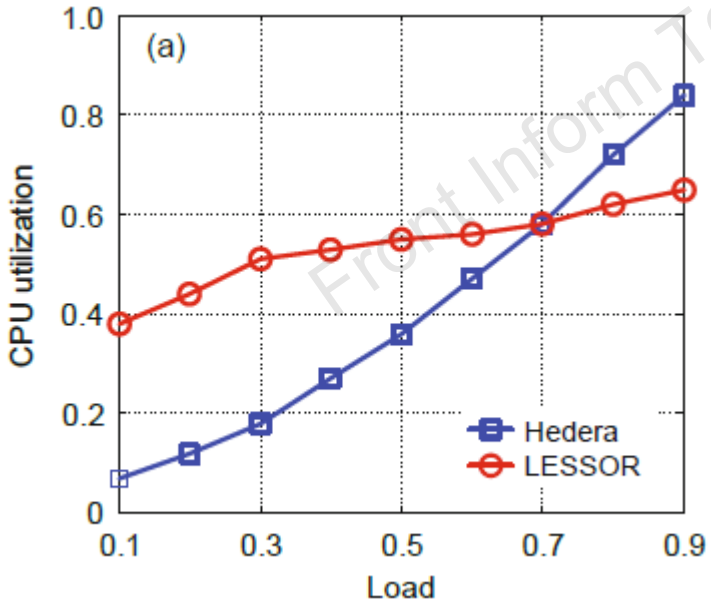
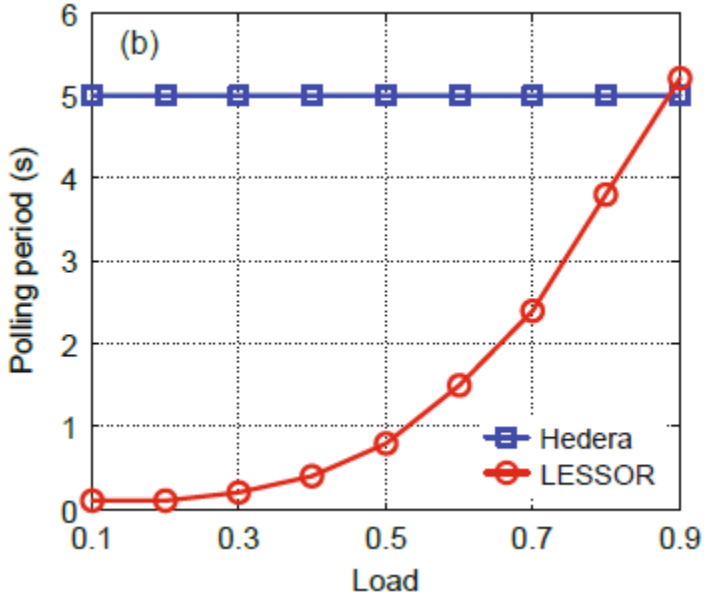


Fig. 6 Throughput of different schemes in the testbed

Major results (Cont'd)

- Compared with Al-Fares's scheme, our method adds less overheads on the controller when the controller is busy, and can effectively use the resource of the controller to execute more fine-grained information inquiry of the network.





Conclusions

- We proposed LESSOR to improve the load balancing as well as network throughput in dense interconnection DCNs .
- LESSOR can effectively use the power of the controller to obtain more fine-grained network information and execute near-optimal resource allocation.
- Deployments and comprehensive simulations show that LESSOR can efficiently improve the network throughput compared with existing schemes.