

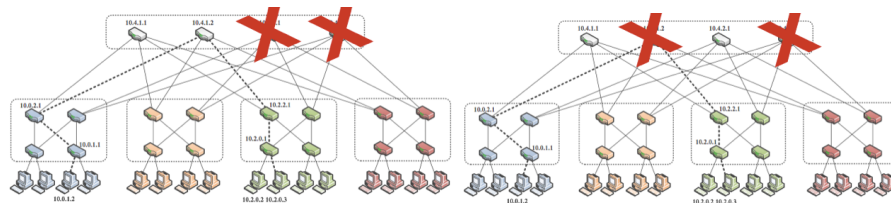
Advances Computer Networks

Assignment 3: Data Center - Network Topology

Assigned on: **9th Mar 2017**
Due by: **16th Mar 2017**

Question 1:

With the switches marked with **X** eliminated, are these two topologies identical? Would they have identical responses to further failures? If not, can you point out one failure scenario where they behave differently? [Figures reproduced with modifications from “A Scalable, Commodity Data Center Network Architecture”, Al-Fares et al., ACM SIGCOMM 2008.]



Question 2:

How does the number of cables in a fat-tree topology scale with the port-count of the individual switches used to build it, i.e., the parameter k ? Ignore constant factors; is it $O(k)$, $O(k^2)$, $O(k^3)$, $O(k^2 \log k)$... ?

Question 3:

What are the limitations of the big switch approach?

Question 4:

From one specific, arbitrary server to another in a different pod, how many ECMP paths can be set up for a fat-tree topology built with switches with k ports each? Ignore any switch hardware constraints on ECMP, we are only looking for the number of equal-cost shortest paths.

Question 5:

What is the number of network hops between two racks in a fat-tree topology? Comment your answer.

Question 6:

Intuitively, why should a topology with small average shortest path length have high throughput?

We are happy to give individual feedback in person on request.