A Novel Hybrid Data Center Architecture Employing Optically-Switched WDM LANs over Electrical Fat Trees

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Abstract

Inter connection network in a data center is the need of the hour as the communication backbone which caters the demands to accommodate a large number of servers with minimum possible end-to-end delay. The traditional Fat tree based topologies play a pivotal role for data center network (DCN) albeit in a low scale, on the other hand the upcoming electrical-cum-optical hybrid architecture demands huge power consumption and exhibit significant end-to-end delay. The present work depicts a proposal of highly scalable novel hybrid architecture employing optically switched WDM LANs (based on ShuffleNet topology) over electrical Fat trees with the use of substantial number of optical devices, the proposed DCN architecture is shown to offer reasonable reduction of end-to-end delay to 12.29 μ s for mouse traffic and 10.01ms for elephant traffic as compared to Optical Switching Architecture (OSA), which has significant 23ms of delay for any traffic condition.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the latest manuscript can be downloaded and [accessed as a PDF](#).

Figures

Figure 1

Basic Structure of Fat tree.

Figure 2

Basic Structure of D Cell topology

Figure 3

Basic Structure of OSA

Figure 4

Basic Structure of Helios topology

Figure 5

8-ary Fat tree structure as used in the Proposed Architecture

Figure 6

Structure of 18 user ShuffleNet with $s=3$, $t=2$.

Figure 7

The Layout of Proposed Hybrid Architecture

Figure 8

Components of one channel (from lower to higher layer) with hierarchical ShuffleNets of proposed DCN architecture

$$S = 24 \times 81 \times 4 \times 128 = 995328$$

Figure 9

The Final Structure of the Proposed Hybrid Architecture

Figure 10

A Node Configuration with Aggregate Traffic.

Figure 11

Downlink traffic for Fat tree

Figure 12

Uplink Traffic for Fat tree