

DATA CENTER NETWORKING

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Abstract- Data center is a pool of resources (computational, storage, network) interconnected using a communication network. Data Center Network (DCN) holds a pivotal role in a data center, as it interconnects all of the data center resources together. DCNs need to be scalable and efficient to connect tens or even hundreds of thousands of servers to handle the growing demands of Cloud computing, applications through internet, storage and backup through internet.

I. INTRODUCTION

Data center infrastructure has been receiving a significant research interest due to growing importance of data centers in supporting and sustaining the rapidly growing Internet-based applications including search engine, social networking, video content hosting and large-scale computations. Massive data centers providing storage form the core of the infrastructure for the cloud. Data center infrastructure including data center networking is well designed so that both the deployment and maintenance of the infrastructure is cost effective. The network topology used for connecting the servers has a great impact on the reconfigurability of the data center that helps in giving a response to the service requirements.

For connecting to the servers, data center uses top of rack (ToR) switches that are interconnected through the end of rack (EoR) switches which are in turn connected via core switches and this leads systematic networking phenomenon leads to significant bandwidth oversubscription on the links in the network core.

II. BACKGROUND AND MOTIVATION

There are two major network fabrics that has been considered for implementing data center networks: Ethernet and InfiniBand (IBA). In this paper we will focus more on Ethernet technology based data center networks. Ethernet is commonly used in data center networks, the nodes can be configured to operate in Ethernet-switched mode. Ethernet 6-byte MAC addressing is flat which means that an interface can be assigned any address without consideration of its topological location. Ethernet switched network, requires no address configuration it has flat addressing, Server interfaces come ready plug and play deployment with manufacturer configured address. When compared to IP routing protocol, Ethernet switched protocol has less efficient routing as Ethernet switched networks have no explicit routing protocols to spread reachability information about the flat addresses of the servers, instead flooding and address learning are the methods used to slowly create forwarding tables. This makes IP routed network more efficient with distinct advantage and also IP addressing is hierarchical and to improve latency and increase throughput IP routing technique is used. The main research concern is on network design in data center networking include:

- How to maintain scalability so that data centers can meet future demands?
- How to achieve maximum throughput while minimizing the cost?
- How to guarantee data integrity and system availability when multiple failures occur in the system?

- How to enhance power efficiency so as to reduce operational cost and make data centers environmentally friendly?

III. DATA CENTER NETWORK TOPOLOGIES

Network topologies provide different ways for the interconnection of servers. Each different topology is characterized by different resource requirements, aiming to bring enhancement to the performance of the data centers. Here topologies can be classified into two categories: Flexible and Fixed. If the network topology cannot be modified is the network is deployed then we classify it as fixed architecture and in case of vice-versa it is flexible.

IV. ADDRESSING, FORWARDING AND ROUTING IN DATA CENTER NETWORK ARCHITECTURES

Within a data center, network topology, routing techniques and protocols define how data packets are delivered from source to the destination. Addresses are used in data centers in order to uniquely identify the interfaces. Forwarding is the mechanism by which we can forward data packets from one link to another at switches and routers. Routing mechanism used to determine the next hop, whether executed on a packet-by-packet basis, or used in conjunction with routing protocols for a pre-configuration tables, are presented for each architecture.

V. TRAFFIC ENGINEERING OF DATA CENTERS

The nature of data traffic is fundamental to the design of data center. Data center traffic includes traffic between data centers and outside the internet, and traffic inside data centers. In data center there are different traffic patterns from different angles of view.

- Macroscopic view: In this data shows that utilization is significantly higher in core layer than in aggregation and edge layers, and edge links have higher utilization than aggregate links because of their low capacities.
- Microscopic view: In this when a set data which was comprised of packet traces collected from five switches of one of the data centers was used to get a view of data traffic, data shows that packet arrivals follow an ON/OFF pattern which means that most packets arrive in groups and there are obvious intervals between the group.

VI. DATA CENTER TRANSPORT PROTOCOLS

In data centers DCTCP protocol which is a TCP-like protocol was designed and is used. The goal to DCTCP protocol is to achieve high burst tolerance, low latency and high throughput with commodity shallow-buffered switches. DCTCP achieves these goals by reacting to the congestion in proportion to the extent of congestion.

VII. PERFORMANCE ENHANCEMENT

We discussed some basics about routing and network topology, these technology establish and maintain

interconnections in data center networks. Most data center network offer hardware redundancy. Hardware redundancy is used for dealing with potential failure and is also used for enhancing the performance when there are no failures.

VIII. FAULT TOLERANT ROUTING

Data center has large numbers of switches and computers and it is unlikely that the whole system can keep running without any failure for the lifetime. In a data center efficiency in performance highly needed so it is the responsibility of the data center that the network must be designed in such a way that it automatically recovers from all the failure. On hardware level, most data center topologies employ redundant links to ensure the connectivity in case of hardware failure.

IX. CONCLUSION

In this research paper we discussed about network topologies, routing protocols of data center networks. We also discussed about the techniques used for enhancing the performance of data center networks and also about fault tolerant.

X. REFERENCES

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