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Comparision of Fat Tree and Ethernet(WAN) Routing in Cloud data centre

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Abstract: Cloud computing is internet-based computing in which large groups of remote servers are networked to allow the centralized data storage and online access to computer services or resources. Network virtualization is a technology that enables hardware network resources to be shared among multiple concurrent software instances i.e. virtual networks. Virtual network is a collection of virtual nodes and virtual links that connect a subset of the underlying physical network infrastructure. Fat-tree is a binary tree where the resources are located at the leaf and intermediate node act as routers. In this paper Prim's MST algorithm used for Fat-tree based routing. It is evident that Fat-tree routing is better in term of efficiency than Ethernet (WAN) routing.

Keywords: cloud computing; network virtualization; data centre; fat-tree; switching; Ethernet (WAN).

I. INTRODUCTION

For distributed computing, the Cloud computing is a recently developing paradigm. It is internet-based computing like the electricity grid in cloud computing information is provided to computers and other devices on demand by software and shared resources. Cloud computing is a paradigm shift following the shift from mainframe to client-server in the early 1980's. It describes the consumption, a new supplement and delivery model for IT services based on the internet, and involves over-the-internet provision.

Network virtualization is a method of combining the available resources in a network by splitting up the available bandwidth in to channels, and each of which can be assigned or reassigned to a particular server or device. Channels can be independently secured. Network virtualization is intended to optimize network reliability, speed, scalability, flexibility and security. It is said to be especially effective in networks. All subscribers shares all resources available on the network [12].

Fat tree is a binary tree where the resources are located at leafs and the intermediate nodes act as routers. The main characteristics of the fat tree are that the links that connect nodes from different levels may have different bandwidth depending on their utilization [10]. All the nodes that connect the i^{th} level and $(i+1)^{th}$ level have the same bandwidth.. In this topology it is assumed that two unidirectional channels form each link, one for each direction [11].

Ethernet (WAN) routing is involved a LAN technology to a cost-effective, scalable and manageable for businesses. Routers are divided in two sections, General Purpose routers and integrated services routers. General Purpose routers focus on WAN routing, supporting a limited number of routing protocols and a variety of WAN interfaces [9]. When one router is used in simple routing, General Purpose routers can be a good choice. For advance technology, an integrated services router allows the customer to take advantages. Integrated services router allows customers to deploy a borderless network, giving them on-demand services, anywhere at any time.

A virtual machine can be configured with one or more virtual Ethernet adapters and each Ethernet adapters has its own IP address and MAC address. Virtual machines have the same properties as physical machines from a networking standpoint. Virtual networks enable functionality not possible with physical networks.

II. PREVIOUS WORK

The virtual network interfaces of guest domains is redefine to incorporate high-level network offload features available in most modern network cards. This demonstrates the performance benefits of high-level offload functionality in the virtual interface, even when such functionality is not supported in the underlying physical interface. Second, optimize the implementation of the data transfer path between guest and driver domains. The overall impact of these optimizations is improvements in transmit performance of guest domains by a factor of 4.4 [2].

In the Xen architecture the virtualized environment have three techniques for optimizing network and performance are evaluate. These techniques keep out the basic Xen architecture of locating device drivers in privileged 'driver' domain with access to I/O devices and providing network access to unprivileged 'guest' domains through virtualized network interfaces [1].

To improve the Xen network virtualization performance by optimizing the interrupt deliver route and shortening the network I/O path is already defined by zhang Jian [3] to present the design and implement of this method. This method gives the benefits and brought by virtualization technology.50% improvement in the Network throughput of a HVM guest domain, 70% reduced in the CPU utility of QEMU driver model and TLB miss and CACHE miss also improved by 40% to 80%. For other I/O devices of virtualization in guest domain, can also be extended the optimization model.

For providing the flexibility to move workload among physical servers, many data centres widely use virtual machine (VMs)

[4]. Which can be placed to maximize power efficiency, application performance or even fault tolerance. Without considering the network topology, congestion, or traffic routes the virtual machines are typically repositioned. Another approach is to design routing so that logical distance between VMs can be reduced. This can be understand by how placement and routing affect overall application performance by varying the types and mix of workloads. Network topologies, and compute resources [5].

III. EXPERIMENTAL SETUP

This section deals with the details of initial experimentation carried out, the experimental scenario considered, data and the platform used along with the results obtained.
Architecture of the various network used for distributed datacenter design.

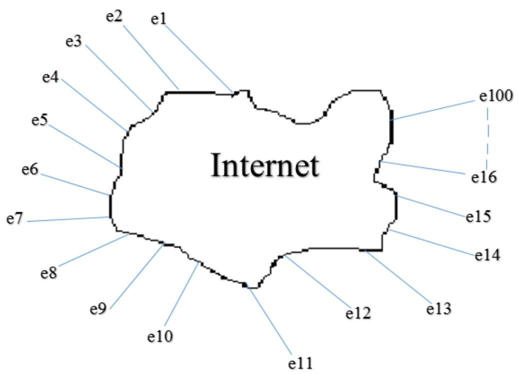

Fig. 1. Ethernet WAN based distributed data centre.

Fig. 2. Aggregate switch based fat tree routing in distributed data Centre.

We have used cloud Sim for simulation of network.

Main features of cloud sim:

- Support for modelling and simulation of large-scale clouds computing data centres.
- Support for modelling and simulation of data centre network topologies and message position applications.
- Support for modelling and simulation of virtualized server hosts, with customizable policies for provisioning host resources to virtual machine.
- Support for modelling and simulation of federated clouds.

Basic Prim's algorithm is used for routing between source and sink of network where source is connected to switch as shown in fig. 2. MST is used as route between all nodes in the network connect through source to aggregate switch.

MST_PRIM'S (G, Cost, ne)

```
For each  i ∈ j [G]
    do min[i] ← ∞
        visited[i] ← NIL
  min[ne] ← 0
  n ← i[G]
  While n! = Ø
      do i← EXTRACT_MIN (n)
          for each  j ∈ Adj [i]
              do if j E n and cost (i,j) < min[j]
                  then visited[i] ← i
                      Min [j] ← cost (I,j)
```

In this experiment we have used switches, aggregate switch, virtual machines, routers, and Root nodes. We compare Fat-tree based routing using aggregate switch as Fat-tree root node and network beneath the root node is considered as sink source base network. In sink source based network we use Prim's minimum spanning tree (MST) algorithm to obtain best routing path. With traditional Ethernet based WAN system (Internet). We calculated time taken by various edge [network route] on above networks. The result obtained for 60 routes after simulation are presented in result section.

IV. RESULTS

Table 1. Time taken (in µsec.) by the various routes of the distributed data Centre within the geographical area.

Route	Fat-tree	Ethernet(WAN)
e1	144	156.384
e2	149	161.963
e3	139	151.232
e4	133	144.837
e5	146	159.14
e6	143	156.013
e7	134	146.328
e8	132	144.276
e9	142	155.348
e10	218	238.492
e11	234	256.23
e12	236	258.656
e13	244	267.668
e14	236	259.128
e15	232	254.968
e16	245	269.5
e17	224	246.624
e18	213	234.726
e19	226	249.278
e20	224	247.296
e21	236	260.544
e22	235	259.675
e23	240	265.44
e24	136	150.552
e25	131	145.148
e26	133	147.497
e27	141	156.51
e28	132	146.652
e29	140	159.88
e30	135	150.255

Table 2. Time taken ((in µsec.) by the various routes of the distributed data Centre outside the geographical area (sea connectivity)

Route	Fat-tree	Ethernet(WAN)
e63	212	242.316
e64	217	248.248
e65	216	247.32
e66	210	240.66
e67	215	246.605
e68	220	252.56
e69	221	253.929
e70	132	151.8
e71	137	157.687
e72	135	155.52
e73	134	154.502
e74	140	161.56
e75	136	157.08
e76	136	157.216
e77	133	153.881
e78	131	151.698
e79	218	252.662
e80	211	244.76
e81	214	248.454
e82	212	246.344
e83	215	249.83
e84	222	258.186
e85	213	247.932
e86	213	248.145
e87	214	249.524
e88	224	261.408
e89	220	256.96
e90	218	254.842
e91	221	258.57
e92	217	254.107

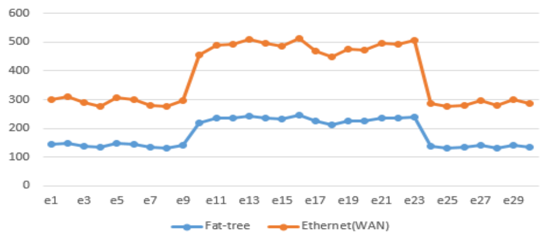

Fig.3. Comparison of Ethernet WAN and Fat-tree routing within the geographical area.

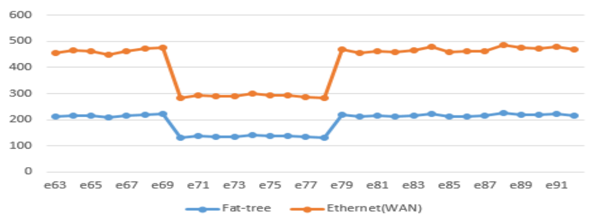

Fig.4. Comparison of Ethernet WAN and Fat-tree routing outside the geographical area.

V. CONCLUSION

We can conclude from results that [Fat-tree routing based on aggregate switch and sink source routing on non-root node with minimum spanning tree (MST) as logical topology of routing.

1). Deviation in routing time between edges in Fat-tree is less than the Ethernet (WAN) routing for distributed data Centre within geographical area as per fig. 3.

2). Deviation in routing time between edges in different geographical area for both type of routing (Fat-tree, Ethernet (WAN)) are quite same as per fig. 4.

3). Efficiency of Fat-tree routing based on aggregate switch and sink source routing on non-root node with minimum spanning tree (MST) as logical topology of routing is almost 70% higher than Ethernet (WAN) routing in terms of routing time.

References

[1] P. Barham, B. Dragovic, K. Fraser, S. Hand, T. Harris, A. Ho, R. Neugebauer, I. Pratt, and A. Warfield. "Xen and the art of virtualization" In 19th ACM Symposium on Operating Systems Principles, Oct 2003.

[2] AravindMenonEPFL, Switzerland Alan L. Cox Rice university, Houston Willy ZwaenepoelEPFL, Switzerland "Optimizing Network Virtualization in Xen".Computer Based Learning Unit, University of Leeds, July 2006

[3] Zhang Jian ; Dept. of Comput. Sci. & Eng., Shanghai Jiao Tong Univ., Shanghai ; Li Xiaoyong ; Guan Haibing, "The Optimization of Xen Network Virtualization". IEEE, CSSE, 2008 Int.Conference (Volume:3)

[4] David Erickson, Brandon Heller, Shuang Yang, Jonathan Chu, Jonathan Ellithorpe, Nick McKeown, Guru Parulkar, Mendel Rosenblum Stanford University "Optimizing a Virtualized Data Center"SIGCOMM'11, August 15–19, 2011, Toronto, Ontario, Canada.

[5] R. Niranjan Mysore, A. Pamboris, N. Farrington, N. Huang, P. Miri, S. Radhakrishnan, V. Subramanya, and A. Vahdat. PortLand: a scalable fault-tolerant layer 2 data center network fabric. 39(4):39–50, 2009.

[6] Kariniemi, H.; Nurmi, J.; *New adaptive routing algorithm for extended generalized fat trees on-chip*, System-on-Chip, 2003. Proceedings. International Symposium on, Vol., Iss., Nov. 19-21, 2003 Pages: 113-118.

[7] Hluchyj, M.G.; Karol, M.J.; *Queueing in high-performance packet switching*, Selected Areas in Communications, IEEE Journal on, Vol.6, Iss.9, Dec 1988 Pages:1587-1597.

[8] Abraham Matta, " Network Virtualization for Virtual Network Embedding" Professor of Computer Science Boston University,2014.

[9] RFC6204.; *https://tools.ietf.org/html/rfc6204*