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QOS for enterprise network

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Abstract:- ***An enterprise network is an enterprise's communications backbone that helps connect computer and related devices across departments and workgroup networks, facilities insight and data accessibility. An enterprise network reduces communication protocols, facilitating system and device interoperability, as well as improved internal and external enterprise data management. The key purpose of an enterprise network is to eliminate isolated users and workgroups. All systems should be able to communicate and provide and retrieve information. Additionally, physical systems and provide satisfactory performance, reliability and security. Enterprise computing models are developed for this purpose, facilitating the exploration and improvement of established enterprise communication protocols and strategies. In our project we are going to form an enterprise network between two colleges in our campus and outside the campus too so that the required data can be transmitted when required. It is a Cisco level project and we are going to work on routers for implementation.***

KEYWORDS: **AUTOQOS, CISCO ROUTERS AND SWITCHES, VOIP, IP PHONES, QUEING MECHANISM.**

I. PURPOSE

The use of Wide Area Networks (WAN) and the Internet in Enterprise Organizations to access applications and data storage at data centers has grown rapidly. This is mostly due to organizations moving towards a centralized architecture where data is stored at the data center versus a distributed architecture in which application servers and data are locally stored at the branch office. This increase in the use of such networks has also increased the need to understand how to best utilize bandwidth for different types of applications that organization are using. A lack of understanding of the capabilities and tools that are available for such purposes have led enterprises to invest in bandwidth as their need grows. One of such tool or capability that can be enabled in network devices or applications is called Quality of Service (QOS) [3].

With the help of QOS, Engineering Managers can manage multiple high priority, latency sensitive and best effort application traffic over the same network bandwidth. The author proposed the use of QOS as the most effective solution in an enterprise environment that brings a number of advantages to both enterprises and the service providers [1].

This field project report is written with the intention that information provided here would help Engineering Managers understand the basic concepts of QOS from a technology perspective and also understand the business side related to strategy, cost and project planning. Enterprises are having problems in determining if they need a bandwidth upgrade on their WAN or they would just need QOS in their network. Both options have drawbacks. Bandwidth upgrade directly increases costs while QOS requires skills to design, implement and support. This document helps Engineering Managers determine the best way to go based on their specific needs.

II. INTRODUCTION

QOS is a technique which enables network administrators to deal with majorly bandwidth related issues jitter, delay, etc [1]. QOS provides the flexibility that can classify and prioritize different applications running in any network as per our requirements to guarantee the performance of those applications. Quality of service is particularly important for the transport of traffic with special requirements.

In the field of computer networking and other packet-switched telecommunication networks, the traffic engineering term quality of service refers to resource reservation control mechanisms rather than the achieved service quality [2].

III. FUNCTIONS PERFORMED BY QUALITY OF SERVICE

QOS serves several functions when properly implemented. It can change the way the network behaves to congestion at the WAN edge. Some of the high-level functions of QOS would be to enable.

• Congestion management when it occurs.

•Delay and jitter sensitive applications can have improved response times.

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• Dedicated bandwidth on a per application basis.

• The avoidance of congestion and setting of traffic priorities.

• Assign queues to each application.

Now that some baseline understanding has been established, some deep diving in the topic is required to better understand the tools available. When talking about the networks there could be lot of vendors and vendor specific implementations. The standards are the same - it's just the implementation models that are sometimes different and vary from vendor to vendor. This paper focuses on the implementation of QOS by Cisco Systems on their Routers and Switches.

- **QOS Tool Set:**

- Classification and marking –

The traffic entering the network are be treated differently for this classification and marking tools set an attribute of a frame or packet to a specific value. It establishes trust boundary that scheduling tools later depend on.

- Policing and markdown tools-

Policing tools determine whether packets are confirming to administratively-defined traffic rates and take action accordingly. Such action could include marking, remarking or dropping a packet.

- Scheduling tools-

Scheduling tools determine how a frame/packet exits a device. When packets enter a device with speed mismatches chances of bottleneck occur. Devices have buffers that allow for scheduling of higher priority packets to exit sooner than lower packet priority packets.

- Link specific tools-

The following are link specific tools:
.Shaping tools.
.Link fragmentation and interleaving tools.
.Compression tools.
.Transmit ring tuning.

- QOS tools are not only useful in protecting desirable traffic, but also in providing differential services to undesirable traffic such as the exponential propagation of worms.

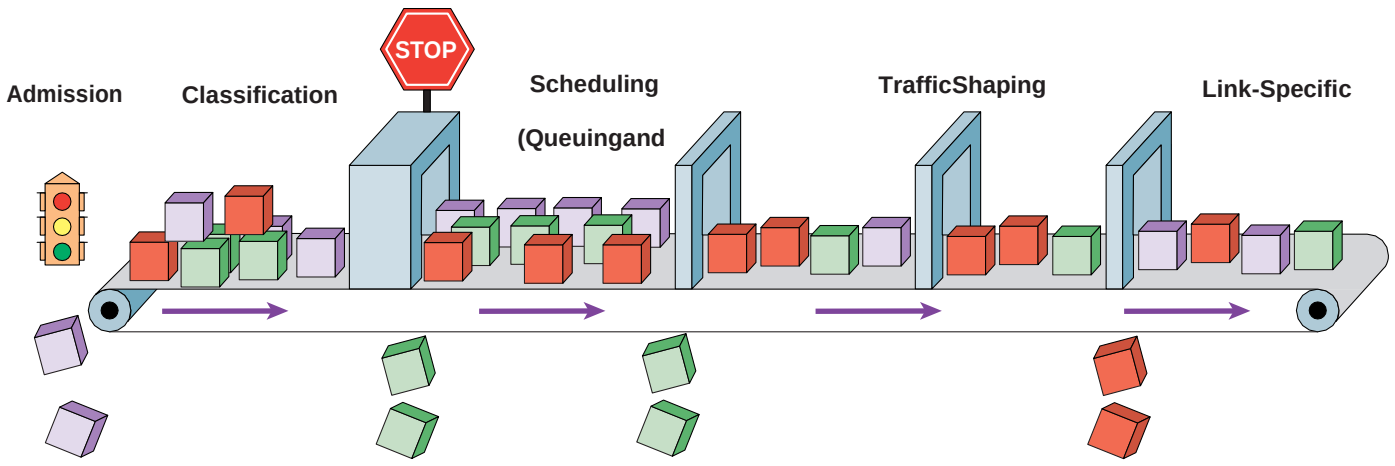

Fig.1: QOS Toolset

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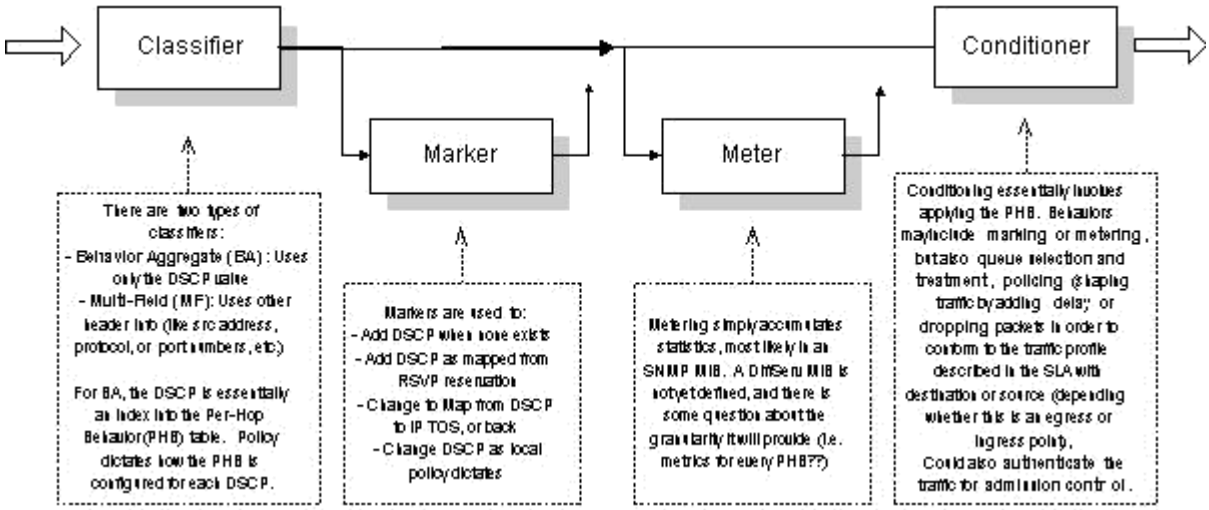

Fig.2: Differentiated Service model

Types of QOS Models

There are two distinct models, Integrated Service model and Differentiated Service model, to help resolve quality of service issues in the network and each take care of specific needs.

a. Integrated Service Model:

This is the model where resources are first reserved throughout the network as requested by the initiator to its destination on the network. Once the network bandwidth is reserved and resources are assigned, the actual traffic flow takes place. RSVP or Resource Reservation Protocol was developed to support this model, also defined under RFC 2205. RSVP is not covered in this document because it is not widely used. Most Enterprises use the Differentiated Service model which is discussed next[2].

b. Differentiated Service model:

The next QOS model that has been widely used, deployed and discussed in this paper in detail is Differentiated Services or Differentiated Service model. It provides a simple and coarse method of classifying services of various applications.

In Differentiated Service model architecture, end-to-end QOS is deployed using per-hop behavior. The differentiated service approach to providing quality of service in networks employs a small, well-defined set of building blocks from which a variety of aggregate behaviors may be built. A small bit-pattern in each packet, in the IPv4 TOS octet or the IPv6 traffic class octet, is used to mark a packet to receive a particular forwarding treatment, or per-hop behavior, at each network node. A common understanding about the use and interpretation of this bit-pattern is required for inter-domain use, multi-vendor interoperability, and consistent reasoning about expected aggregate behaviors in a network. There are currently two standards per hop behaviors (PHBs) defined that effectively represent two service levels (traffic classes):

• **Expedited Forwarding (EF):** Has a single code-point (Differentiated Service value). EF minimizes delay and jitter and provides the highest level of aggregate quality of service. Any traffic that exceeds the traffic profile (which is defined by local policy) is discarded. Typical use is in Voice applications.

• **Assured Forwarding (AF):** Has four classes and three drop-precedence within each class. Excess AF traffic is not delivered with as high probability as the traffic "within profile," which means it may be demoted but not necessarily dropped.

PHBs are applied to the traffic when it enters a network according to pre-determined policy that was configured on a router or a switch. The traffic may be marked at this point, and routed, then unmarked at the network exit point. There was a development done at the end-host application, i.e. end hosts can also apply the Differentiated Service marking, like Cisco IP Phones and Windows operating system. There are a number of advantages in doing so but not discussed here as it's out of the scope of this paper.

This functionality is enabled in every Differentiated Service enabled router, although not all functions are used all the time. Typically, border routers--at ingress and egress points-apply functions, but interior routers may also.

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IV. PROCESS FOR DEPLOYING QOS

Enabled Network Services Companies can follow a five-step process to deploy QOS. This can be tied to the above mentioned five inter-related strategic steps:

• Define business objectives:

• Identify mission-critical applications; Make sure that very few applications get this classification, so better end-to-end performance across the network is observed.

• Obtain endorsement on business requirements from executives.

• Determine how many classes of traffic are required to meet objectives more classes translates to more granular service.

- **Analyze service-level requirements**:

• Voice, which is affected by loss, delay, and delay variation.

• Video, also affected by loss, delay, and delay variation

• Data, which varies according to the application. Different versions of the same application can have different traffic types and characteristics. Therefore, in the case of increased data traffic or applications, QOS requirements must be re-evaluated to accommodate required service levels.

• Design and test QOS policies against business objectives and requirements.

• Roll out the QOS designs to production network in phases, during scheduled downtime.

• Monitor service levels to help ensure that objectives are met across the entire network. This step should be done in parallel with step 4 for validity of the design.

V. CONCLUSION

In this paper we have presented the use of QOS on network to manage the available bandwidth to give maximum throughput also advantages of using IP phones is demonstrated .With the help of QOS we can enhance the network system and cut off any kind of congestion by prioritizing the packets. Thus ,QOS is important for Enterprise Networks that are moving towards deploying voice, video and data applications over the same, single and current network infrastructure. This is feasible related to both the business and applications.

VI. FUTURE ENHANCEMENT

- Control over resources.
- More efficient use of network resources.
- Coexistence of mission-critical applications.

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