DHC Working Group
INTERNET-DRAFT

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DHCP Option for Host QoS
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Status of this Memo

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Abstract

This document defines a new Dynamic Host Configuration Protocol (DHCP) option that is passed from the DHCP Server to the DHCP Client to define which QoS mechanism and the specific classification settings to be used by the host in its IP datagram forwarding field. This document describes the option support for IP datagram network layer QoS mechanisms. This option does have the ability to support data link layer QoS mechanisms if so defined in future updates of this document.

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1. Introduction

Quality of Service (QoS) has become a critical success factor in the transition to converged multiservice applications within both the metropolitan multi-system operators (MSO) and enterprise networks, with the latter being the source and destination of converged multiservice applications. The integration of telephony traffic with an array of complex data applications, each with different service requirements, makes network engineering and management much more difficult. With each network-attached system that requires application specific QoS settings supported by the MSO networks, the problem of managing QoS has assumed a position of great importance. For example, the quality of streaming media is significantly affected by small erratic delays in the stream that become magnified significantly to the end user.

QoS mechanisms have been widely used for a period of time in the WAN, but this is not so true in the case of MSO networks that provide access to local ASP services and the public Internet. This is changing with the acceptance of converged packet-based multimedia applications. In addition, the growing use of intranets, extranets and VPNs has made QoS control on an end-to-end basis a necessity. Wire speed operation is needed so that the QoS "solutions" do not introduce more problems than they solve. Managing QoS functionality should be as simple and as user friendly as possible.

With the acceptance of the Dynamic Host Control Protocol (DHCP) for dynamically supporting network-attached systems, the support for dynamically defining QoS settings per network scope is a natural extension.

2. Requirements Terminology

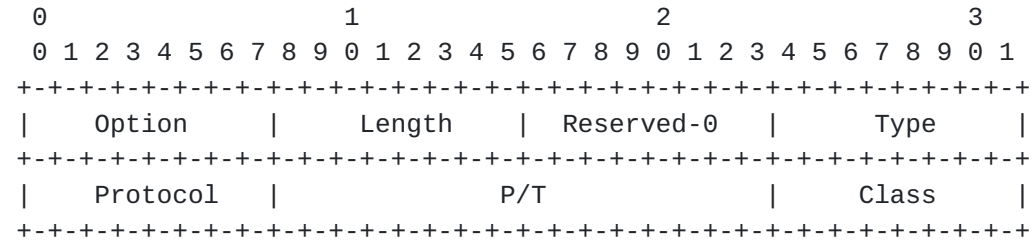
The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [1].
The DHCP related terminology used in this document is described in RFC 2131 [2] and RFC 2132 [3].

The Type of Service (IPv4) and Traffic Class (Ipv6) terminology used in this document is described in RFC 791 [4] and RFC 2460 [5] respectively.

The Differentiated Services (Diffserv) terminology used in this document is described in RFCs 2474, 2475 and 3168.

3. Host QoS Option Definition

The Host QoS DHCP option contains the QoS mechanism to be implemented and a list array of transport layer protocols, service port numbers and the bits thrown pattern in the type of service (ToS) byte field for IPv4 datagrams and Traffic Class field for IPv6 datagrams.



Option: 8 bits

DHCP_QOS_OPTION (to be assigned by IANA).

Length: 8 bits

Length Field is the total bytes of this option, not including the Options code and Length bytes.

Reserved-0: 8 bits

Reserved Field for future use sent as zero and ignored on receipt.

Type: 8 bits

Type Field defines the standards based QoS mechanism to implement for the defined application protocol.

0	IP Precedence
1	Type of Service
2	Diffserv
3	Diffserv-ECN
4-254	Reserved for future assignment
255	Experimental

NOTE: The remaining Type Field descriptor bits (4-254) MUST be reserved for future assignment of QoS mechanisms. Future assignments MAY include QoS mechanisms supported at the Data Link layer for traffic management within the LAN, WAN or MAN. An example would be the support of IEEE 802.1p/q.

Protocol: 8 bits

Protocol Field indicates the next level protocol used in the data portion of the IP datagram. The values for various protocols are specified in "Assigned Number" [7].

P/T: 16 bits

Port or Type Field indicates the next level protocol port or type number used in the data portion of the IP datagram. The values for various protocol port and protocol type numbers are specified in "Assigned Number" [7].

Class: 8 bits

The Class Field is used to specify the bit pattern of the IP forwarding field (i.e. DS, ToS, Precedence or Traffic Class) that define a per protocol-P/T pair classifier.

Simple Example of Use:

```
DHCP_QOS_OPTION { 2;              # QoS Mechanism Type
                  6, 80, 90;      # Protocol, P/T, Class in Hex
                  6, 8080, 90;    # Protocol, P/T, Class in Hex
                  17, 10000, 28;  # Protocol, P/T, Class in Hex
                  17, 2944, 68;   # Protocol, P/T, Class in Hex
                  1, 0, 98;       # Protocol, P/T, Class in Hex
                  50, 0, 68;      # Protocol, P/T, Class in Hex
                }
```

4. Host QoS Option Usage

With Diffserv and ECN obsolescing the traditional ToS settings and Precedence Fields, the potential for conflicts arise. Different or conflicting QoS technologies may be deployed across a single autonomous network. Indicating the locally adopted QoS mechanism, along with the corresponding protocol-P/T pair classification settings, allows administrators to distinguish between differing or incompatible QoS technologies that may exist between the LAN, the WAN, the Internet and other boundaries. Assuming the "border" routers between these QoS domains have a proper or standards based interpretation of the classification settings, and then possibly remarking settings as traffic traverses these boundaries, this DHCP option allows administrators to dynamically configure hosts to utilize the specified QoS mechanism along with the protocol-P/T pairs settings without confusion on the nature of the bits being set in the IPv4 ToS, IPv6 Traffic Class or DS fields.

Those protocols, protocol ports and types that are not specifically indicated via this option MUST NOT be limited in the QoS mechanisms that may be employed in the use of those protocols. This option is only one means by which QoS configurations may be implemented. QoS configurations may be achieved by other means. However, QoS configurations employed by other means MUST NOT explicitly conflict with those QoS configurations indicated via this option. Use of this option SHOULD NOT create any error conditions by causing DHCP clients to mark traffic in a method unknown to intermediary devices. That is the responsibility of the standards-based QoS mechanisms themselves, and the devices upon which the mechanisms are implemented [5]. For example, DIFFSERV [10] requires the use of a "default" per-hop behavior (PHB) when there is no matching codepoint.

With DHCP clients required to accept a minimum DHCP option field of 312 octets, and the ability to concatenate an additional 64 octets of option space via option 52 (option overload) [8], the DHCP_QOS_OPTION can theoretically define at least 94 separate

protocol-P/T pair classifications.

5. IANA Consideration

The value for the DHCP_QOS_OPTION code must be assigned from the numbering space defined for public DHCP Options in RFC 2939 [6]. This must not conflict with any other numbers already allocated in this numbering space.

6. Security Considerations

This proposal in and by itself provides no security, nor does it directly impact existing security. This proposal does overtly expose the QoS technologies deployed within a network segment, the applications that take advantage of those technologies, and the relative prioritization given to those applications. This option does not indicate the resources allocated based on the settings. Use of this option does not enable Denial of Service (DoS), though possessing such knowledge could be used to increase the effectiveness of DoS attacks by marking such traffic with a relatively high prioritization.

7. Acknowledgements

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