Performance measurements for Differentiated Services in IPv4 and IPv6

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***Abstract*—**

***Index Terms*—Measurement campaign, Quality of Service, QoS, TOS field, DSCP**

I. Introduction

The Internet only provides best effort services to its connected participants and does not provide delivery or performance guarantees. However, since the very beginning of the standardization of the IP protocol, Quality of Service was recognized as an important topic. The Type of Service (TOS) and Traffic Class fields were included in the IPv4 and IPv6 headers, respectively, consisting of 8 Bits which are reserved for the use of QoS meachanisms, allowing packets to get prioritized on their way through the routing infrastructure. In IPv6 an additional Flow Label was added to the header with 20 Bits. But how efficient is this mechanism and does its use indeed provide greater performance with lower latency and faster deliver of packets? And how many routers are supporting these QoS mechanism and honor TOS bits set in the IP header? This research aims to answer those questions by performing a large scale measurement campaign. We look at the different priority categories and compare their support in routers in IPv4 and IPv6.

In IPv4 the QoS mechanism in the IP header was called the TOS field, in IPv6 it was called Traffic Class (TC). RFC 2474 attempts to rename the TOS octet of the IPV4 header, and Traffic Class octet of the IPV6 header, respectively, to the Differentiated Services (DS) field [1]. The DS field takes up 6 Bits, leaving 2 Bits as Currently Unused (CU) bits. Figure 1 illustrates the separation. Multiple categories called the Differentiated Services Code Point (DSCP) were defined and encoded in the DS field to represent the priority of a packet, which can be found in Table I. In order to support legacy systems that do not already implement the newest standard, the first 3 Bits in the Class Selector range are mapping to the Precedence Bits of the previous interpretation. Therefore, even systems following the old standards are still able to understand the QoS that is desired by the sender.

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
|         DSCP          |  CU   |
+---+---+---+---+---+---+---+---+

  DSCP: differentiated services codepoint
  CU:   currently unused
```

Fig. 1. DSCP and CU

TABLE I
QoS mapping in the IP header

DSCP	Binary	IP Precedence	AF class	Drop prob.
CS0	000 000	Routine	Best effort	test
CS1	001 000	Priority	AF11/AF12/AF13	test
CS2	010 000	Immediate	AF21/AF22/AF23	test
CS3	011 000	Flash	AF31/AF32/AF33	test
CS4	100 000	Flash Override	AF41/AF42/AF43	test
CS5	101 000	Critical	test	test
CS6	110 000	Internet	test	test
CS7	111 000	Network	test	test

[a]Sample of a Table footnote.

Identify applicable funding agency here. If none, delete this.

II. Related Work

III. Research Questions

We defined the following research questions:

1) How much benefit in performance do we gain by using the QoS mechanism of the DS field in the current Internet infrastructure in IPv4 and IPv6?
2) What share of routers is currently supporting QoS and to which extent?
3) Since there are ambiguties in what different RFCs specify for the use of those 8 bits, what share of routers is following which convention?
4) Are certain autonomous systems (AS) providing better support of QoS than others?

IV. Methodology

In order to answer the previously defined research questions, we will perform a large scale measurement campaign using the infrastructure of PlanetLab. PlanetLab has the advantage to provide several thousands of vantage points (VP) all over the world in different networks. It gives us the opportunity to test the different categories of QoS parameters and discover differences that are based on routes taken depeding on the geolocation of sender and recipient.

A. Measurement Architecture

B. Types of Measurements

We plan to perform the following measurements:

Acknowledgment

We thank xyz.

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