



Quality of Service measurements for IP networks

NetHawk
M5

www.nethawk.fi



Application Note

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Introduction

The Quality of Service (QoS) provided for a subscriber in IP-based networks is a factor which will differentiate the operators from each other. The attributes related to load conditions, performance and available bandwidth, like delay, delay variance, gained bit rates per second and packet loss, will determine whether the service is usable and fulfils the subscriber's QoS expectations.

To guarantee QoS for subscribers, measurement of QoS attributes has to be started already in the laboratory environment and continued during roll-outs and in operational networks. You can perform QoS measurements with the NetHawk M5's QoS application.

Quality of Service measurement need in IP-based networks

The key performance indicators of the Quality of Service in IP-based networks are related to delay, jitter, throughput, packet count and packet loss. In most cases, they directly affect how an end user experiences the service. That is why 3GPP has defined throughput, delay and packet loss limits for subscriber QoS classes.

If a user is making a VoIP call, the absolute delay should not exceed a critical threshold value. In this case, throughput is less significant because speech does not carry so much information. On the other hand, if the user is watching a video stream, throughput directly affects the quality of the video presentation on the user terminal, but absolute delay is not so important. However, it might be critical for an operator, because long delays usually require buffering capacity from network equipment. Jitter, or variations in delay between subsequent data packets, is an annoying feature in stream-oriented applications such as multimedia or VoIP. In addition, it could be troublesome for the 3G network operator because large jitter requires buffering capacity, too. With higher than 1% packet loss a VoIP call degrades significantly.

QoS option in NetHawk M5

The QoS option allows storing of QoS KPIs to MySQL database. Storing to the database is simple – define the information you want to store from the application and then click the 'Start db storing' button. All analysed data from file or from analysed lines are stored to the database.

Solution in brief:

1. NetHawk M5's QoS application for quality, load and performance evaluation in IP-based networks.
2. Supported QoS KPIs include delay, jitter, throughput, packet count and packet loss between two measurement points.
3. KPI operations for IP, TCP, UDP and RTP protocols.
4. Quick overview to problems with graphical reports.

Diagnostics UI is used as a reporting tool to see quickly the results of the tests. Different reports can be created, stored and used for any data available. Simply selecting the data-source and time-line, you can create reports from the tests.

Usage and Use Cases

You can perform delay, throughput, jitter, packet count and packet loss measurements for IP traffic with the NetHawk M5's QoS application. You can perform the measurements between any nodes in the network. The Diagnostics UI gives you an easily understandable and clear picture of the characteristics of the network traffic. The results of your QoS measurements can be saved to be examined later, e.g., against other measurements performed in other circumstances.

DELAY MEASUREMENT

With the QoS application the delay of an IP packet stream between two measurement points is measured by capturing the same packet from two places and calculating the difference between the data packets' catching. Because the end-to-end delay is divided into pieces which can be observed independently, you can find the bottlenecks in the network reliably. In order to uncover problematic network elements, you must measure delay across the network elements. If IP packets are captured from two points in between certain network elements, the delay generated by routers and switches located between those network elements can be estimated, too.

THROUGHPUT MEASUREMENT

With the QoS application you can determine the data transfer capacity of your network. The QoS application measures the amount of data passing through a point in a time unit to give the data transfer capacity in B/s. The measurement is done by summing the payload size from IP headers. The throughput results are broken down to total IP traffic, IP/UDP datagram stream and IP/TCP datagram stream.

The QoS application also allows you to learn the resending ratio for TCP/IP packets, which tells you how efficiently network capacity is utilised: the higher the resending ratio is, the lower the efficiency is. High throughput with a high resending ratio will be seen as a poor throughput value from the end user perspective.

JITTER MEASUREMENT

It is important to measure the delay variance, or jitter, in the network to adjust the buffering functions within the network element. The QoS application measures the jitter of an IP packet stream between two measurements by comparing the sequential delay measurement results.

PACKET LOSS MEASUREMENT

VoIP does not tolerate much packet loss, estimated 1%, before the quality degrades significantly. The packet can be lost or it arrives late to its destination. In the QoS application you can define the delay for a packet after which it is classified as lost.

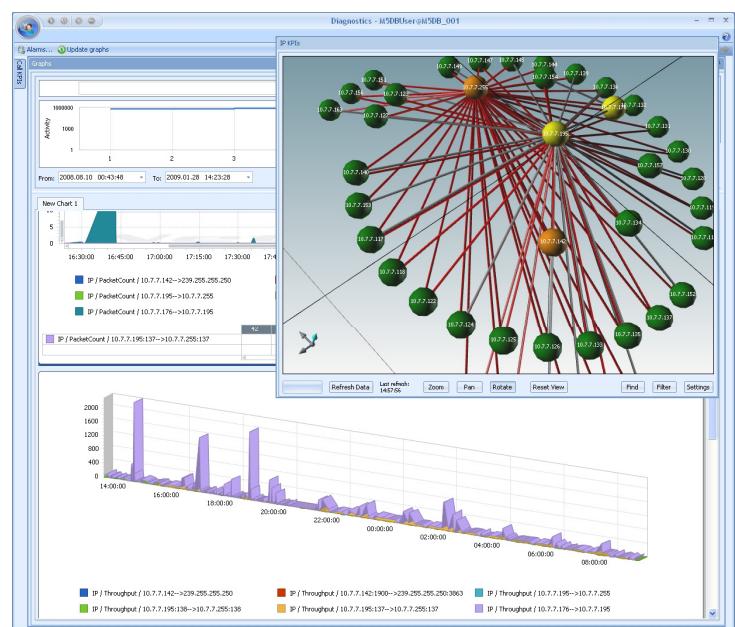


Figure 1: Analysing QoS KPIs with NetHawk M5.