

## Performance Measurement of Broadband Connections: An Enhanced Tool

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**Abstract:** *The performance of broadband Internet connections is an important qualifier in discussions about user experience, Internet Service Provider (ISP) assessments and national economic status. Performance can be quantified in a number of ways, including speed, latency, jitter and packet loss. While several tools have been developed to measure these parameters, many of these tools measure only one metric and offer limited flexibility for user configurations, such as single broadband connections and fixed test times. This paper discusses the development of enhanced algorithms and, correspondingly, a software application for the performance measurement of broadband Internet connections. The enhanced tool, TINQA (Totally Integrated Network Quality Application), is a native Windows<sup>®</sup> application, developed using the C# programming language and the .NET framework, and measures speed, latency, jitter and packet loss. The algorithms used to measure latency, jitter and packet loss were based on the employment of Windows<sup>®</sup> Raw Sockets and the Internet Control Message Protocol (ICMP), while the algorithm used to measure speed was based on downloading and uploading relatively large files (>250 MB) from and to several public File Transfer Protocol (FTP) and Hypertext Transfer Protocol (HTTP) speed test servers. TINQA produced results similar to those obtained from some of the most popular existent performance testing tools, including speedtest.net, testmy.net and pingtest.net. Additionally, the results were consistent across multiple tests, indicating that the algorithms were robust and that the added flexibility in testing did not compromise the accuracy of the tests in the application.*

**Keywords:** *Broadband Performance, Network Quality, Speed, Latency, Jitter, Packet Loss*