

Bandwidth Measurements from a Consumer Perspective - A Measurement Infrastructure in Sweden

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This abstract describes a real-world application of bandwidth measurements. We will report on a consumer-oriented bandwidth estimation infrastructure in Sweden, TPTEST. We will report on the experiences to date from this infrastructure and on our plans to augment TPTEST by including new research findings from the bandwidth estimation area.

1 Background

The number of homes connected to broadband access networks is steadily increasing. Sweden is one of the top countries in the world in household connectivity. In Sweden, there are around 80 regional and national broadband access providers, offering access in speed ranges from 0.25 Mbps to 30 Mbps, utilizing a number of different techniques.

This diversity has caused concerns about the possibility for the customer to evaluate the delivered service, and also about the possibility to compare offers when shopping for a broadband connection.

Therefore, three governmental agencies¹ have joined forces to provide the consumers with a test tool called TPTEST. The tool itself is developed by the Swedish company Gatorhole AB. The TPTEST tool provides a way for consumers to test the performance of their connectivity. In the following, we will describe the test infrastructure.

2 Swedish Consumer-Oriented Network Test Infrastructure

The aim of the test infrastructure is for consumers to be able to measure their access networks.

It is important to point out that the test infrastructure has been built with the consumer perspective in mind. It has therefore been considered important that the test infrastructure is independent of any single operator (and also that it is *perceived* by the costumers as operator independent). Operator-provided test infrastructures run the risk of being biased (or at least of being perceived as biased) in favor a one particular operator.

For the Swedish TPTEST tool and infrastructure, the aforementioned governmental agencies are the providers of tool and infrastructure. This is accepted from consumers as well as from operators as a way to ensure that tests and comparisons are fair and not biased.

2.1 Description of Infrastructure

The following description is of TPTEST version 4 if not otherwise noted.

The TPTEST infrastructure consists of a number of test servers in the national network. The test servers are typically located close to the edges of the backbone network. The idea is that a test

¹The agencies are Konsumentverket (the national consumer agency), Post- och Telestyrelsen (an agency that controls the operators in the postal and telecom areas) and Internet-InfrastrukturStiftelsen (an agency that controls the national Internet infrastructure).

session should measure the access network rather than the backbone network. The governmental agencies provide some test servers, but any operator is free to set up their own test servers (and many operators do). Using an operator-provided test server may bias the results, but can be useful if the user is interested of the performance inside the operator's network.

A consumer that wants to use TPTEST downloads a client program. When started, the client program connects to one of the TPTEST servers and starts sending streams of test packets. After the tests, the server responds with the test results.

There is also a possibility to use the TPTEST infrastructure for operator comparison. Each TPTEST server logs the results of tests performed by all users. A user interested in comparing operators X and Y could ask the server to provide the average bandwidth values that other users having access through operator X have obtained, and compare that to average values from users connected through operator Y.

3 Experiences

There are a number of interesting points that we will elaborate on in our presentation.

There is a large interest among the consumers, not least for the possibility to compare operators as described above. TPTEST provides real results of real measurements, and this is obviously considered more valuable than the nominal bandwidth advertised by operators.

A tool for general consumer use must be very simple: It must be simple or trivial to install, with a minimum of options. Its results must be very simple to interpret.

Keeping it simple for the ordinary user, the interpretation of results may suffer. TPTEST version 4 measures TCP throughput only. How this "raw" TCP throughput compares to the performance of e.g. web browsing or streaming media is not obvious.

4 Ongoing Work

We have started a collaboration with the developers of TPTEST. The goal of this collaboration is to provide the developers with state-of-the-art measurement and analysis methods that are stable and simple to manage. This way, new research results can be rapidly put into good practical use.

One interesting area is the possibility to combine active measurements and monitoring. Since the TPTEST servers log results from other users, these results could possibly be used to improve the accuracy and/or lower the number of packets in the probe session.

Another interesting possibility is to be able to use the test servers as point for a network tomography-like inspection of the backbone network. This could, together with "normal" TPTEST information about the access networks, help in the estimation of end-to-end performance between two consumer nodes (useful in e.g. peer-to-peer networks).