

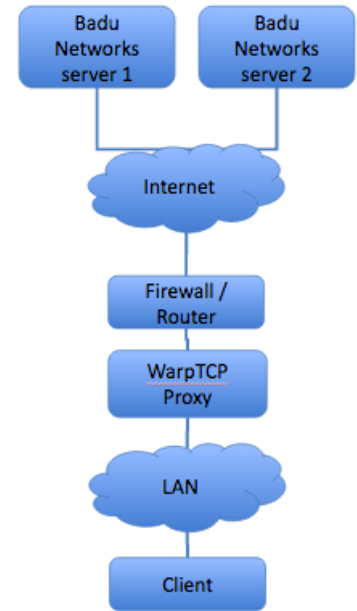
Customer Test Tool Guide

Quickstart: Internet Configuration

Windows

- Install the included Visual Studio C++ Redistributables on the client
 - Run vc_redist_x64.exe or vc_redist_x86.exe, depending on your Windows version.
- Start the client application:
 - Double-click on BaduTestTool.exe and click on Launch. Note: Internet Explorer is not supported.
- Configure the test:
 - Set the target servers, Badu networks, or your own.
 - Using your own server requires installing the test server application.
 - Add tests as desired for different file sizes, uploads and downloads.
- Run:
 - Click on the green Play button below Test Control.
- Collect results:

Click on the Download Output CSV button below Test Statistics for a spreadsheet of results on the per-test level.

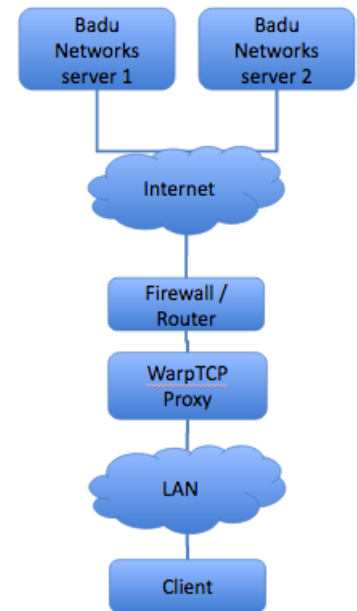


Quickstart: Internet Configuration

Mac or Linux

- Start the client application:
 - Double-click on BaduTestTool and click on Launch.
 - keep the default system port
- Configure:
 - Use the default test servers
 - Add different test runs as desired. Test sizes may include a suffix (e.g. 10M, 20k).
- Run:
 - Click on the green Play button below Test Control.
 - Stop prematurely with the red square button if necessary.
- Collect results:

Click on the Download Output CSV button below Test Statistics for a spreadsheet of results on the per-test level.



Purpose

IP networks and the Internet can be very dynamic in nature. As a result it can be difficult to accurately determine the difference in data rates for different network configurations. In order to make evaluating the benefit provided by WarpEngine or WarpGateway easier Badu Networks has created this application. The source is available in Python, and executable versions are available for Windows, and Mac OS X. The output of the test is provided as a comma separated variable (CSV) file, easily read by typical spreadsheet programs.

WarpTCP Theory Of Operation

- A WarpTCP proxy such as WarpGateway or WarpEngine is a transparent TCP proxy in that its existence is not apparent to the users except that their connections appear faster.
- The WarpTCP proxy is placed between the server and client.

- TCP sessions are terminated and proxied unless bypassed by specific bypass rules defined for each logical pair
- All other traffic is bypassed and not terminated, for example
 - Multicast
 - UDP
 - Other protocols
- VLANs are supported with a logical proxy per VLAN
 - Traffic does not mix between VLAN interfaces
- The WarpTCP proxy accelerates traffic downstream from the proxy
- By inserting the proxy upstream of the congestion or jitter in the network, the proxy uses WarpTCP congestion control to regulate traffic through that part of the network. As a result the TCP is accelerated through the portion of the network that was previously limiting TCP throughput.
- WarpTCP can add significant benefit when throughput is limited by TCP's congestion control and not by hardware limitations such as internet connection speed.
- Significant jitter that adversely affects TCP can be added by things like VPNs, Cable modem networks (DOCSIS), and Wireless networks.

Choosing A Test Method

- Network congestion is highly dynamic. The method for testing benefit in this environment needs to be specifically designed to address this dynamic behavior.
 - The test should be chosen given the network configuration that will be deployed in.
 - A number of test should be performed and averaged to get a good estimate.
- Two main network configurations influence how the tests should be run.
 - All of the TCP traffic on the client side of the proxy is being accelerated by WarpTCP.
 - Use alternating TCP and WarpTCP traffic and then average the measured throughput
 - Network congestion can change significantly over very short periods of time. If only two file transfers were compared, the first transfer might see an uncongested network, while the second could see a badly congested one. As the number of alternating measurements increases, the effect of the dynamic network congestion is averaged out.
 - There is a mix of accelerated and non accelerated traffic.
 - Use Simultaneous comparison between WarpTCP and standard TCP
- A small sampling of a random process such as network throughput leaves a lot of uncertainty in the true average value. Increasing the number of measurements can improve the estimate of the mean value. One common method to mathematically estimate the uncertainty of the result is called a "Confidence interval" . Care should be taken in making quantitative conclusions about the benefit without understanding what the uncertainty of the measurement is.

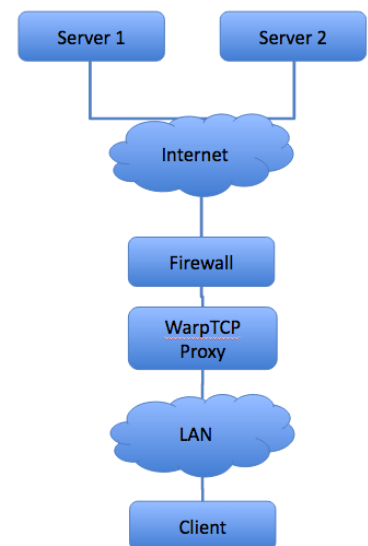
Example Test Setup (Accelerated Internet)

Test considerations

- WarpTCP can add significant benefit when throughput is limited by TCP's congestion control and not by hardware limitations such as internet connection speed.
- LAN throughput is typically higher than the internet connection.
- Significant jitter that adversely affects TCP can be added by things like VPNs, Cable modem networks (DOCSIS), and Wireless networks.
- Server 1 and 2 should share essentially identical network paths.

Setup

- Install test application on servers and clients
- Configure the test application
- For any test : What is the question I am trying to answer ?
- If I install a WarpTCP proxy, how will my download throughput improve?
 - All traffic downstream from the proxy is WarpTCP. Use alternating WarpTCP vs TCP test.
- If I install a WarpTCP proxy, how will my uploads improve ?
 - Traffic in the internet will be a combination of TCP and accelerated WarpTCP. Use simultaneous WarpTCP / TCP measurement.
- Select file sizes that are typical of the traffic that you are interested in accelerating
- Configure selective bypass rules on the proxy that will cause traffic going to one of the servers to be bypassed



Example Test Setup

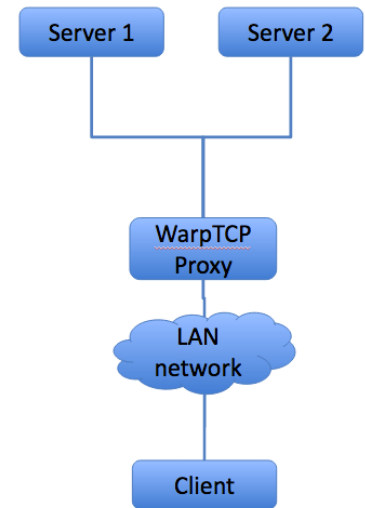
(Private Network)

Test considerations

- Significant jitter that adversely affects TCP can be added by things like VPNs, and Wireless networks.
- Server 1 and 2 should share essentially identical network paths.
 - Two IP addresses on the same machine is the best.

Setup

- Install test application on servers and clients
- Configure the test application
- For any test : What is the question I am trying to answer ?
- If I install a WarpTCP proxy, how will my download throughput improve?
 - All traffic downstream from the proxy is WarpTCP. Use alternating WarpTCP vs TCP test.
- If I install a WarpTCP proxy, how will my uploads improve ?
 - Traffic in the internet will be a combination of TCP and accelerated WarpTCP. Use simultaneous WarpTCP / TCP measurement.
- Select file sizes that are typical of the traffic that you are interested in accelerating
- Configure proxy selective bypass to bypass traffic come to or going from one server. Alternatively if you are careful to avoid congested networks you can route to a server without going through the proxy



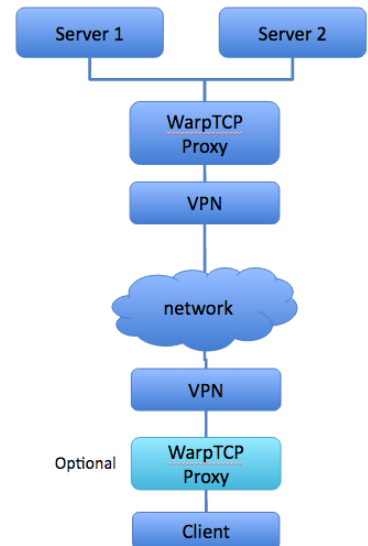
Example Test Setup (Remotely Connected Sites)

Test considerations

- WarpTCP can add significant benefit when throughput is limited by TCP's congestion control and not by hardware limitations such as internet connection speed.
- LAN throughput is typically higher than the internet connection.
- Significant jitter that adversely affects TCP can be added by things like VPNs, Cable modem networks (DOCSIS), and Wireless networks.
- Server 1 and 2 should share essentially identical network paths.

Setup

- Install test application on servers and clients
- Configure the test application
- For any test : What is the question I am trying to answer ?
- If I install a WarpTCP proxy, how will my download throughput improve?
 - All traffic downstream from the proxy is WarpTCP. Use alternating WarpTCP vs TCP test.
- If I install a WarpTCP proxy, how will my uploads improve ?
 - Traffic in the internet will be a combination of TCP and accelerated WarpTCP. Use simultaneous WarpTCP / TCP measurement.
- Select file sizes that are typical of the traffic that you are interested in accelerating
- Alternatively if you are careful to avoid congested networks you can connect the alternate server so that the traffic does not go through the proxy.



Quickstart: Private Configuration

Windows

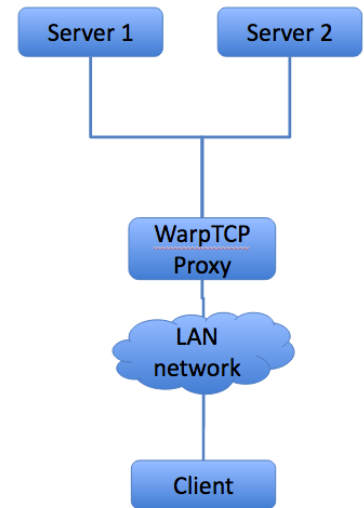
Server Installation

- Prerequisite step (only needs to be done once)
 - Install the included Visual Studio C++ Redistributables.
 - Run vc_redist_x64.exe or vc_redist_x86.exe, depending on your Windows version.

- To start the server:
 - Double-click on BaduTestServer.exe. Enter an unused port (e.g. 34567). The server should now be running on the specified port.
 - Edit your [firewall settings](#) to allow TCP traffic on the specified port.
- To start additional instances of the server, simply repeat the previous steps and choose a different port.

Client Installation

- Start the client application:
 - Double-click on BaduTestTool(.exe) and click on Launch. Note: Internet Explorer is not supported.
- Configure:
 - Enter the IP address of your servers (e.g. 192.168.1.50:34567, where 34567 is the port that BaduTestServer listens to).
 - Add tests as desired for different file sizes, uploads and downloads.
- Run:
 - Click on the green Play button below Test Control.
 - Stop prematurely with the red square button if necessary.
- Collect results:
 - Click on the Download Output CSV button below Test Statistics for a spreadsheet of results on the per-test level.



Quickstart: Private Configuration

Mac or Linux

Server Installation

- There are no prerequisites to install.
- To start the server:
 - Linux / Mac OS X: Open a Terminal and run `execute BaduTestServer`. Enter an unused port (e.g., 9000). The server will now be running on that port.
 - Make sure to modify your Firewall to allow incoming TCP traffic on the specified port
- To start additional instances of the server, simply repeat the previous steps and choose a different port.
- NOTE: If you have trouble running the executable, check the file permissions. On Mac, you may also need to allow programs not acquired through the App Store.

Client Installation

- Start the client application:
 - Double-click on BaduTestTool(.exe) and click on Launch.
- Configure:
 - Enter the IP addresses of your servers (e.g. 192.168.1.50:34567, where 34567 is the port that BaduTestServer listens to).
 - Add tests as desired for different file sizes, uploads and downloads.
- Run:
 - Click on the green Play button below Test Control.
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