

WAN Emulator



Table of Contents

Introduction	1
System Requirements	2
Installation	3
Configuration	5
Performance Counters	7
Troubleshooting	9
License Agreement	10
Contact Us	13
Index	a

1 Introduction

Purpose

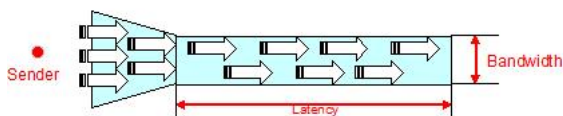
WAN Emulator is intended to simulate Wide Area Network (WAN) in the local network environment, allowing efficient, low-cost software quality testing. This software helps to test functionality of your TCP/IP client server application by emulating latency and bandwidth of the WAN. By using this software you can easily simulate DSL, CableModem, Satellite and T1 - type connections.

How it works

WAN Emulator acts as a TCP/IP proxy server between client application and a server. Instead of connecting directly to the server clients is configured to communicate through the WAN Emulator. Emulator handles all data passed through it by keeping bandwidth limit and introducing latency.

Metaphor

The Wan Emulator transferring TCP/IP data could be compared to a pipeline system transferring water.



This metaphor gives us intuitive definitions of bandwidth limit and latency parameters. The width of the pipe limits pipeline throughput, i.e. how much water could enter or leave pipe – this is our bandwidth limit. The length of the pipeline not affects throughput but cause delay for each drop of water from the start to the end of pipeline system. Imagine that water goes through pipeline with constant velocity 1 ft/sec. So, let's measure length of pipe in seconds. If we increase length of pipeline by 1 ft, then the drop of water will take extra 1 second to travel through the pipe. Therefore, the length of the pipeline – is our latency. This software acts analogous to the "pipeline system" - it allocates enough "capacity" (here computer memory) to keeping the delayed data.

Here we made assumption that pipeline latency is always constant, but in real life, it is not. This software also accounts for situation where sender sends more data, than the "pipeline" allows, or when receiver receives data slower, than it should. Those are all natural effects which could be seen in the real WAN networks.

2 System Requirements

Operating System

Microsoft® Windows® 98
Microsoft® Windows® 98 Second Edition
Microsoft® Windows® Millennium Edition
Microsoft® Windows NT® 4.0 Workstation with Service Pack 6.0a or later
Microsoft® Windows NT® 4.0 Server with Service Pack 6.0a or later
Microsoft® Windows® 2000 Professional
Microsoft® Windows® 2000 Server
Microsoft® Windows® 2000 Advanced Server
Microsoft® Windows® 2000 Datacenter Server
Microsoft® Windows® XP Home Edition
Microsoft® Windows® XP Professional
Microsoft® Windows® Server 2003 family
Microsoft® Windows® Vista

Processor

Pentium 133 MHz or higher

Memory

256 MB of RAM or Higher

Software

The Microsoft .NET Framework version 2.0 (x86 or x64) redistributable package. Freely available for download [here](#).

3 Installation

Before you install the software, please make sure you login to the computer as Administrator or other account with sufficient privileges to install the windows services. This software installs windows service called "XP Idea WAN Emulator Host Service", which is required . If your account has insufficient privileges, this service installation will fail and the software will not function as intended.

To start installation simple execute "xpidea.wanemulator.install.msi" or "setup.exe" shipped on the media.

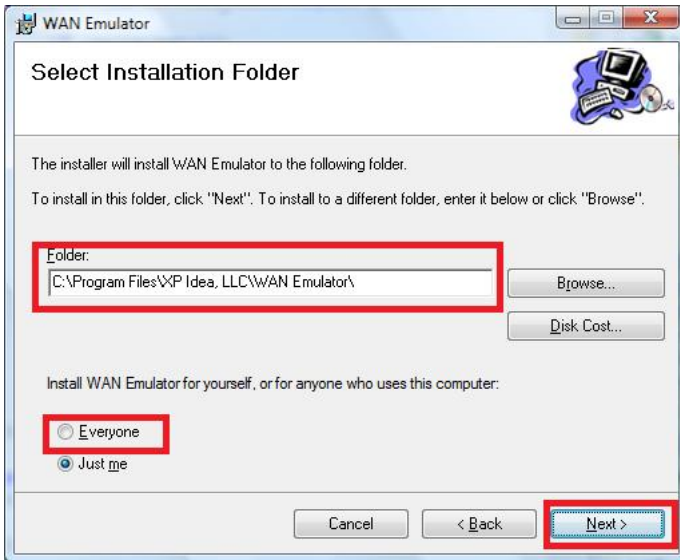
Windows Vista users.

To install the software, right mouse click on the "xpidea.wanemulator.install.msi" or "setup.exe" and select "Run as administrator" from drop down menu.

Click "Next" on the following screen:



On the following screen you can change program location. Please make sure you select "Everyone" radio button, so the software will be available to all users on this machine. Click "Next" to continue.



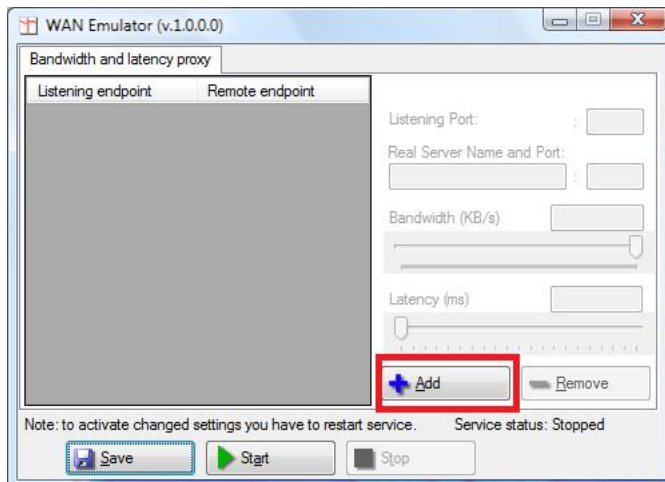
Click "Next" through the rest of the screens to complete the installation. Once process completes, "WAN Emulator" configuration screen will show up. At this moment you'll be able to configure the software and start the service. Please see **Configuration** (see page 5) section for more details.

4 Configuration

WAN Emulation Configuration console is used to configure the software. The screen will require you to enter all the settings, necessary for your TCP/IP client and server applications to work together. If you don't know those settings, please ask your system administrator for help. Information required:

- **Listening Port** -the TCP/IP port where our software would listen for your client application to connect (Typically it is a number below 65534, for example "8081"). Please make sure your client application is configured to connect to that PC and this port number, instead of original server. Also please note, that the port you select here may be blocked by Windows Firewall or other firewall software, therefore please make sure you configure the firewall to enable communication on this port.
- **Real Server Name** - the IP address, computer name or domain name of the machine where your TCP/IP server is running. Examples of input: "192.168.0.32", "QATEST_PC", "www.mytestserver.com"
- **Real Server Port** - the port number on which your server "listens" for clients.
- **Bandwidth** - defines the bandwidth you want to set. Please note, this setting is in Kilobits per second (Kbps) and applies on the up stream and down stream separately. For instance if you set 200 Kbps, the up stream will allow for speed of 200 Kbps of data to be sent to the server, as well as data from the server will be received with the maximum speed of 200 Kbps. So, the actual bandwidth of the "pipe" will be 400 Kbps.
- **Latency** - delay, which the data sent will incur. Measured in milliseconds (ms). As with the Bandwidth, delay is separate for the up stream and downstream, therefore, if your client application requests the data from the server and receives the response, the actual latency will be twice of the set value plus overhead of the local network (30-100 ms).

To configure the software, first click "Add" button on the screen.



Enter all required data, set the Bandwidth and Latency and click "Save" button.



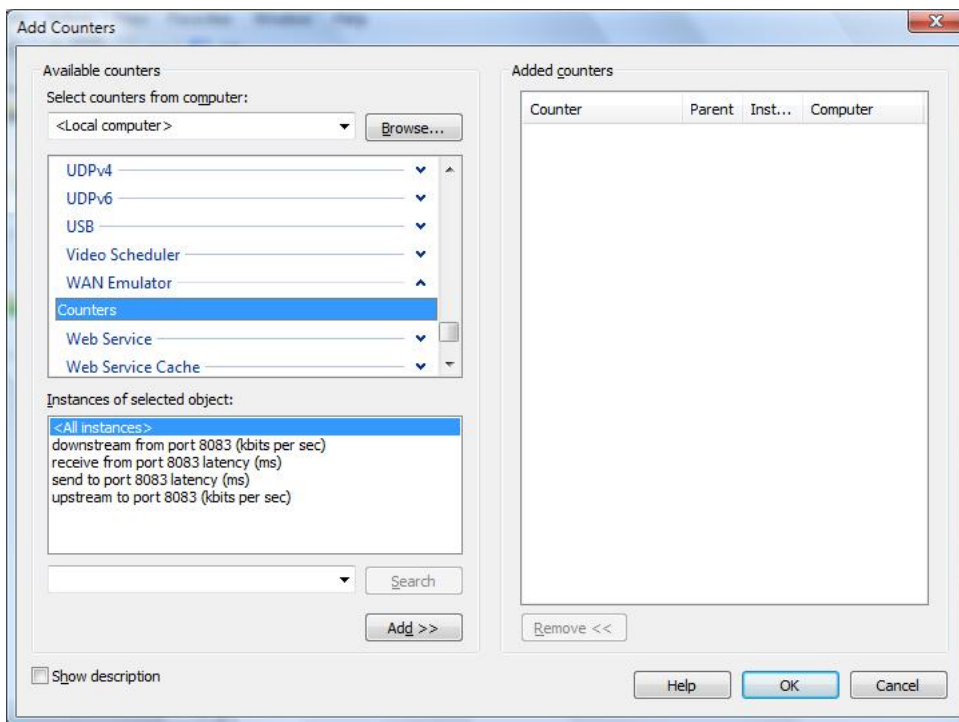
Once done, you can click "Start" button to start the service and close the screen-our software does not rely on this screen to function. It runs as windows service. There is one thing to note: All connected clients will be disconnected, if you modify the settings and save the changes while service is running.

5 Performance Counters

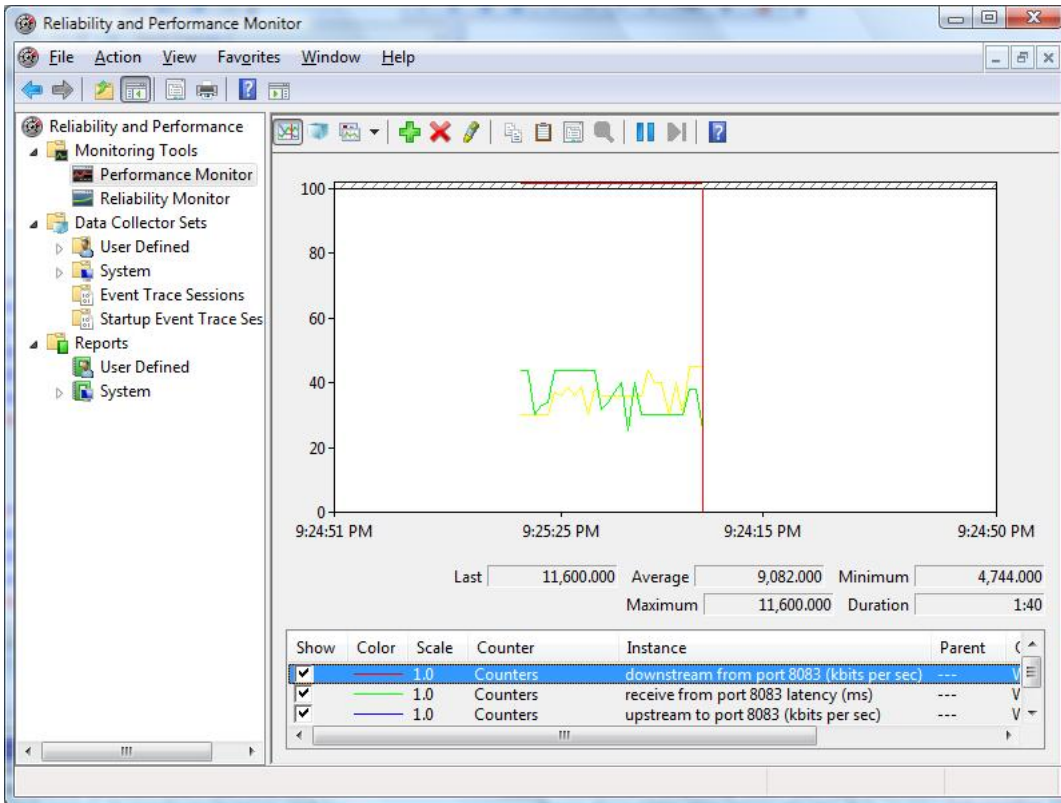
The WAN Emulator allows tracking of the actual latency and bandwidth values through a build-in performance counters, available through a system performance monitor . There are 4 counters per configured plug-in- 2 counters (latency and bandwidth) for upstream and 2 counters for downstream.

Important: Performance counters get automatically installed when WAN Emulator application starts, although installation procedure requires special permissions under Windows Vista (tm). Therefore, please make sure you run application under local Administrator account at least first time, to let the software to install counters. Once the counters are installed, application may continue under regular user credentials.

Once application is **configured and running**, all the counters will be available under "WAN Emulator" category in the system performance monitor:



From there you can either add them to a System Performance Chart or use them through any other performance profiling application, such as HP LoadRunner (r).



6 Troubleshooting

This software has extensive built-in logging functionality, which you can use to troubleshoot miscellaneous issues. All the relevant information is written into different log files, which are located in the installation folder.

File Name	Purpose
XPIdea.WanEmulator.Host.InstallLog	Contains host service installation log. Please refer to it if service wont install or start.
XPIdea.WanEmulator.Host.log	Contains all events and errors related to the functionality. Please refer to it to track down client-server communication and errors.
plugins.conf	Contains WAN emulator configuration in XML format. This file gets written by GUI and read by the service when its started.

Log4Net

The application uses one of the most advanced application logging frameworks, called Log4Net(C) (<http://logging.apache.org/log4net/>). Here are sample of Log4Net configuration settings defined in the **XPIdea.WanEmulator.Host.exe.config** file:

```
<?xml version="1.0" encoding="utf-8" ?>
<configuration>

  <configSections>
    <section name="log4net"
      type="log4net.Config.Log4NetConfigurationSectionHandler, log4net" />
  </configSections>
  <log4net>
    <appender name="LogFileAppender" type="log4net.Appender.FileAppender">
      <param name="File" value="xpidea.wanemulator.host.log" />
      <param name="AppendToFile" value="true" />
      <layout type="log4net.Layout.PatternLayout">
        <param name="Header" value="[Header]\r\n" />
        <param name="Footer" value="[Footer]\r\n" />
        <param name="ConversionPattern" value="%d [%t] %-5p %c %m%n" />
      </layout>
    </appender>

    <appender name="ConsoleAppender" type="log4net.Appender.ConsoleAppender" >
      <layout type="log4net.Layout.PatternLayout">
        <param name="Header" value="[Header]\r\n" />
        <param name="Footer" value="[Footer]\r\n" />
        <param name="ConversionPattern" value="%d [%t] %-5p %c %m%n" />
      </layout>
    </appender>

    <root>
      <level value="ERROR" />
      <appender-ref ref="LogFileAppender" />
      <appender-ref ref="ConsoleAppender" />
    </root>
  </log4net>

</configuration>
```

This configuration file allows error logging into "xpidea.wanemulator.host.log" file, although please follow the URL above, to get more information about advanced logging features and their configuration.

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WAN Emulator.

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Index

C

Configuration 5

Contact Us 13

I

Installation 3

Introduction 1

L

License Agreement 10

P

Performance Counters 7

S

System Requirements 2

T

Troubleshooting 9