

LINKTROPY[®] RECORDER

USER'S GUIDE

Version 1.1



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TECHNOLOGIES

Linktropy® Recorder User's Guide

Revision 1K, January 2017

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Part No. DOC-UG-LR-1K

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1 OVERVIEW

The Linktropy Recorder is an application for Windows and Linux that captures and records the delay and loss characteristics over time of a wide-area network link or network path. The Linktropy Recorder is designed for use in conjunction with the Linktropy Player functionality of the Linktropy WAN emulator. The Linktropy Recorder captures the conditions of the live network and records them to a file. The recording file is then loaded into the Linktropy Player which replays the captured conditions, reproducing the delay and loss characteristics of the live link in a repeatable test environment.

The Linktropy Recorder sends ICMP Echo requests, commonly referred to as “Pings,” from the PC on which it is running to a specified device on the other side of the network, and captures the reported delay and loss values. The Linktropy Recorder can probe the link up to ten times per second and record up to 100,000 data points. By using the zoom controls, particular periods of interest can be displayed and saved in separate recordings for individual playback.

The Linktropy Recorder and Player use an open file format described in the Recording File Format section of this document. The data saved by the Linktropy Recorder can be reviewed and edited. In addition, users can manually create recording files with arbitrary sequences of delay and loss that can be loaded into the Linktropy Player.

The Linktropy Recorder is available at no charge to users of the Linktropy WAN emulator. The latest version of the Linktropy Recorder can be downloaded from the support section of the Apposite website at www.apposite-tech.com.

The Linktropy Player requires version 4.0 or later of the Linktropy WAN emulator, and recording files can be replayed in any Linktropy model except the Mini Series (Mini, Mini2, and Mini-G). For more information on the Linktropy Player, please consult the *Linktropy WAN Emulator User's Guide*.

The Apposite Recorder for Android™ provides similar functionality on Android-based phones and tablets. Most features of the Linktropy Recorder for Windows and Linux and the Apposite Recorder for Android are identical, but there are some minor differences. Please refer to the Help text within the Apposite Recorder for details of its operation. The Apposite Recorder for Android is available for free download on Google Play™.

2 INSTALLATION

The Linktropy Recorder runs on Windows 10, 8, 7, and XP, and on Linux distributions Debian 7+, Ubuntu 12+, and Fedora 17+. It must run in an account with appropriate permissions to access the network. Please ensure that all firewall and anti-virus software are configured to allow the Linktropy Recorder to access the network.

2.1 Installation on Windows

To install the Linktropy Recorder, click on the setup file and follow the instructions on the screen.

To uninstall the Linktropy Recorder, click on Windows Start > All Programs > Linktropy Recorder > Uninstall Linktropy Recorder.

2.2 Installation on Linux

To install the package on Fedora:

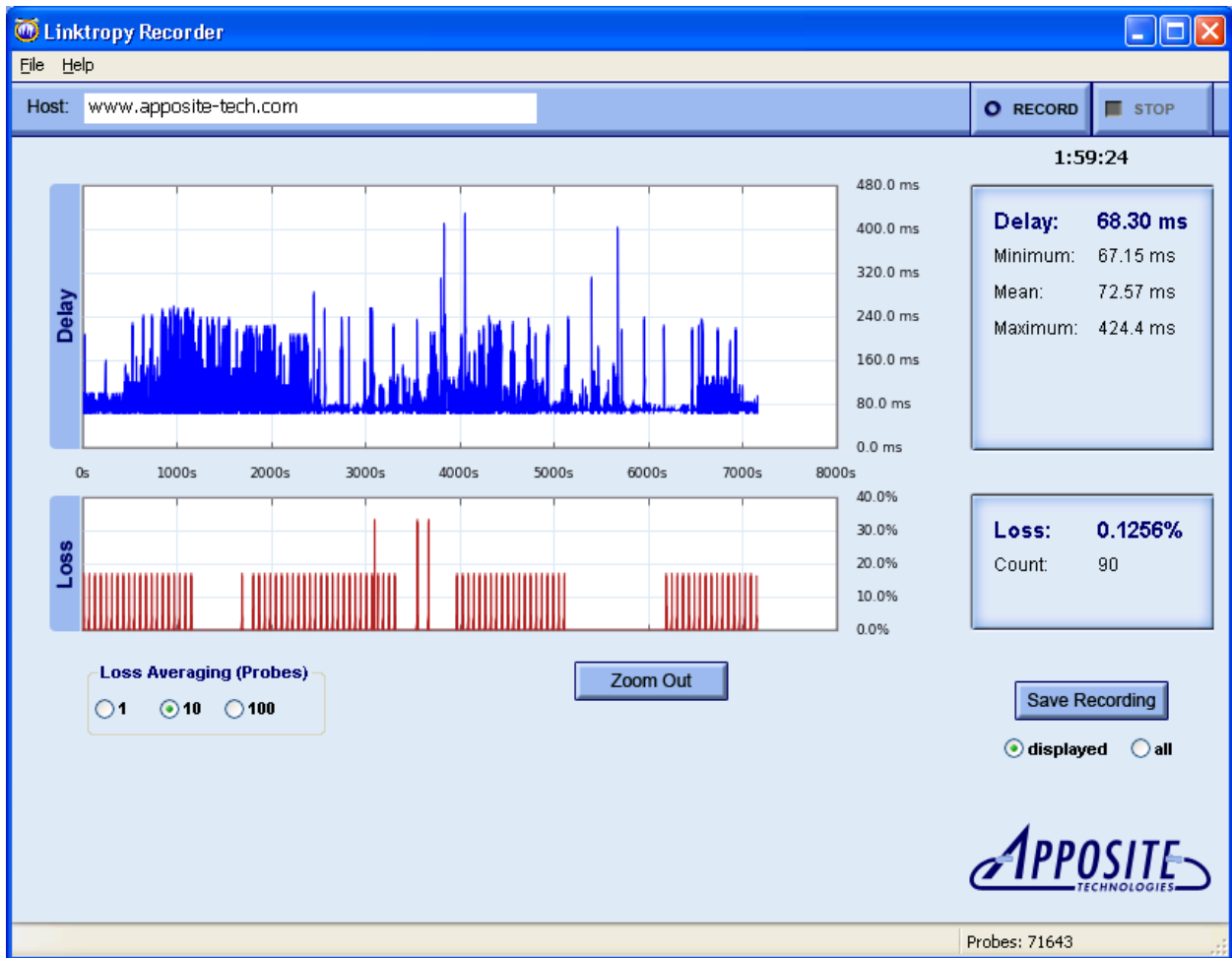
```
sudo yum install wxGTK wxPython python-matplotlib python-matplotlib-wx
sudo rpm -ivh linktropy-recorder-1.1.1-1.noarch.rpm
sudo linktropy-recorder
```

To install the package on Ubuntu or Debian:

```
sudo apt-get install python-matplotlib python-wxgtk2.8
sudo dpkg -i linktropy-recorder_1.1.1-1_all.deb
sudo linktropy-recorder
```

The Linktropy Recorder requires root privilege on Linux to send ICMP packets. Run the Linktropy Recorder from the root account or use `sudo`, e.g.:

```
sudo linktropy-recorder
```



Linktropy Recorder Main Screen

3 OPERATION

To use the Linktropy Recorder, first open the application. On the top bar of the main screen, specify an IP address or host name of a device on the other side of the network. The Linktropy Recorder collects delay and loss statistics for the network path between the PC on which the Linktropy Recorder is running and the specified remote device. Please make sure that the remote device can respond to ICMP Echo requests, and that any firewalls between the two devices do not block ICMP packets.

3.1 Recording Controls — Record, Stop, Save

To begin collecting data, press the *Record* button. While the Recorder is running, other controls except for Loss Averaging are disabled. When finished, press *Stop*.

To save the data to a recording file, click the *Save Recording* button. If the zoom in /out controls have been used to display a portion of the full recording, a radio button below the *Save Recording* button controls whether to save the entire recording or only the subset currently displayed on the graph.

Once the file has been saved, it can be viewed, edited, and loaded into the Linktropy WAN emulator.



Be sure to save any data prior to starting a new recording. Previously captured data are cleared when the *Record* button is pressed.

3.2 Zoom In / Zoom Out

To zoom in on particular time intervals of interest, place the cursor over the Delay or Loss graph, hold down the left mouse button, and highlight the interval to view. Once the mouse is released, the graph will zoom in to display the selected interval. The graph can be progressively zoomed in to smaller intervals up to the maximum precision of the data.

To zoom back out, click on the *Zoom Out* button. Each click on the *Zoom Out* button will undo one zoom operation.

3.3 Loss Averaging

A single probe can only generate a loss rate of either 0% or 100%. Individual probes are aggregated to produce composite values that are displayed on the Recorder graphs and saved in the recording file. The Loss Averaging control specifies the number of probes to use to produce the composite loss values. Click on the appropriate radio button to choose between 1, 10, and 100 probes. By default, loss values are averaged over 10 probes.

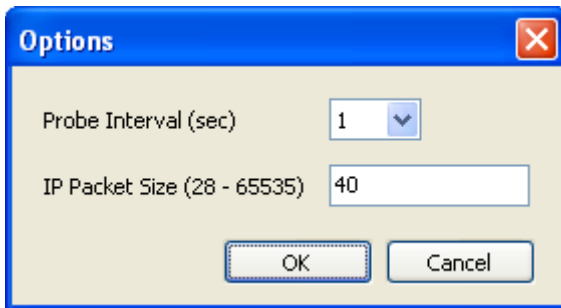
Longer averaging intervals use more data points and therefore offer greater granularity, but can miss short term effects. A loss averaging rate of 1 probe turns off averaging and shows each individual loss.



To capture short-term effects with greater precision, use a shorter probe interval to generate more data points over the same time period.

The loss rate at any point in time is calculated as a rolling weighted average over the loss averaging interval, centered on that point in time. For example, a loss averaging interval of 10 seconds means that the reported value for any point in time is an average of the loss rate reported in the 5 seconds before and 5 seconds after that point, weighted towards the values closest to the center of the interval. The end of the loss graph is adjusted as the probes from after each point return.

4 OPTIONS



4.1 Probe Interval

To change the frequency of the probes, click on File > Options, and use the drop-down selector to choose the desired probe interval. By default, the Linktropy Recorder probes the link once per second. To capture short-term effects with greater precision, use a shorter probe interval to generate more data points over the same time period. To reduce the load on the network, particularly when using large packets, or to record more than 24 hours of link conditions, select a longer probe interval.

The table to the right shows the maximum recording time for different probe intervals.

The probe interval can not be changed while a recording is in progress.

Probe Interval (sec.)	Max. Recording Time
0.1	2 hours, 46 minutes
0.5	13 hours, 53 minutes
1	27 hours, 47 minutes
2	2 days, 7 hours
5	5 days, 18 hours
10	11 days, 13 hours

4.2 IP Packet Size

To change the size of the probe packets, click on File > Options, and enter the desired size of the IP packet in bytes. By default, the Linktropy Recorder uses 40 byte probes. The probe may be any size between 28 and 65535 bytes.

The packet size cannot be changed while a recording is in progress.



Some devices may not respond to the probe if the packet size causes fragmentation (usually greater than 1500 bytes).

5 DATA

The ICMP echo request probes used by the Linktropy Recorder can only determine the delay and loss for the round trip from the Recorder to the remote device and back. The delay and loss graphs show these round-trip values. However, the Linktropy WAN emulator uses separate delay and loss rates for the forward and return paths. When saving the recording file, the data is converted into two separate, symmetric, one way values:

- ▶ Delay: the one-way delay in each direction is calculated as half the round-trip time (RTT).
- ▶ Loss: the one-way loss rate in each direction is derived such that the probability of packet loss over two one-way trips matches the reported round-trip loss rate.

6 RECORDING FILE FORMAT

The recording is a text file with the format described below. The recording file may contain up to 100,000 lines of data.

Line Type	Syntax and Description
metadata	<p># <attribute> : <value></p> <p>A list of attributes of the recording and their values. Must be at the beginning of the file, prior to any recording data, and preceded by a "#" symbol. Defined attributes are:</p> <p># Title : <recording title></p> <p>The title of the recording. The Recorder creates a title of "<hostname> to <destname>". The hostname is the system running the Recorder. The destname is the name or IP address entered in the host field of the Recorder.</p> <p># StartTime : <time></p> <p>The local time that the recording was started.</p> <p># ProbeInterval : <interval></p> <p>The frequency of the probes, as specified in the Options dialog.</p> <p># PacketSize : <size></p> <p>The size of the probe packets, as specified in the Options dialog.</p> <p># LossAveraging : <value></p> <p>The setting for the Loss Averaging at the time the recording was saved.</p>
data	<p><start time> <delay> <loss> [<delay> <loss>]</p> <p>Start time is the time in seconds, relative to the beginning of the recording, when the delay and loss values of this line take effect. Start time is a floating point number and must be at least 0.01 seconds greater than the start time of the previous line.</p> <p>Delay is the one-way latency, specified in milliseconds with a resolution of 0.1 ms.</p> <p>Loss is the packet loss rate in each direction, specified as a percentage (without the percent sign) between 0.0000 and 100.0000.</p> <p>The second pair of delay and loss values are optional. If two pairs of values are supplied, the first pair is the LAN A to LAN B direction and the second pair is the LAN B to LAN A direction. If only one pair of values is supplied, the same values are used in both directions. Note that a single pair of values is used as two identical one-way values and not as a single round-trip value.</p> <p>On the final line of the file, the start time is used to determine the duration of the previous line. Delay and loss values are ignored.</p>

7 SUPPORT

If you experience any problem with the Linktropy Recorder, please check the Apposite website at <http://www.apposite-tech.com> for updated software and documentation. If your problem is not resolved, please contact Apposite Support at:

support@apposite-tech.com
1.310.477.9955 ext. 2

Please be sure to include the following information:

- ▶ Linktropy model
- ▶ Serial number
- ▶ Your e-mail address and phone number
- ▶ Software version number
- ▶ A detailed description of the problem

APPENDIX A:

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