TTYredirector User Guide

Version 4.0 for Linux x86

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Quick Start Guide

How to install and use TTYredirector for most common applications.

Installation Notes

Additional details related to installing TTYredirector software.

Using TTYredirector

A complete guide to all TTYredirector commands.

Troubleshooting

Using trace data to diagnose problems encountered by applications.

Installation Notes

System Requirements

To install TTYredirector:

- The target computer must be running a Linux x86 distribution. Examples include Red Hat Enterprise Linux, Fedora Core, SUSE and Debian.

- Linux must provide Unix98 pty devices, which are present by default for most Linux distributions. The TTYredirector installer will inform you if they are not present.

To use TTYredirector with networked device servers:

- Device servers (serial servers, modem pools) must accept TCP/IP connections for access to their devices.

- Your network (including any firewalls) must permit TCP connections to device servers on the TCP port numbers that the server uses for device access.

Installation Notes

Files Created and Modified

When TTYredirector is installed, the following files are created or replaced:

/usr/local/bin/trconfig — the configuration utility

/usr/local/bin/trquery — the query utility (displays configuration)

/usr/local/bin/trtrace — the trace utilly

/usr/local/sbin/ttyredirectord — the daemon

/etc/ttyredirectord.conf — holds all configuration data

/etc/rc.d/init.d/ttyredirectord — starts the daemon

The following file is created only if the shell installer is used:

/usr/local/sbin/ttyredirectord-uninstall — removes TTYredirector

When TTYredirector is used:

- trconfig commands cause the ttyredirectord to modify ttyredirector.conf

- ttyredirectord creates symbolic links in /dev to Unix98 pty files

- ttyredirectord emits messages to syslog

Installation Notes

The License Key

Without a license key, TTYredirector runs for a trial period of 24 hours and supports only one tty device.

To use TTYredirector without trial period restrictions, obtain a license key. Two types of license keys are available:

- An **evaluation license key** is available at no charge (click here) and enables the use of an unlimited number of tty devices. This license key expires 30 days from the date it is issued.

- A **permanent license key** is purchased and permanently enables the use of a specific number of tty devices.

A license key is entered using the *trconfig* command.

If a permanent license key is used in more than one installation, TTYredirector detects a license conflict.

Installation Notes

Removing the Software

TTYredirector software can be removed in two ways, depending on how it was installed:

- If installed with the RPM kit, use RPM to erase the package:

    ```
    # rpm -e ttyredirector
    ```

- If installed with the shell kit, run the shell script uninstaller:

    ```
    # /usr/local/bin/ttyredirectord-uninstall
    ```

The *ttyredirectord* daemon is stopped and all TTYredirector tty devices immediately cease operation.

If TTYredirector is later reinstalled, all previous settings are restored.

Installation Notes

Daemon Commands

The TTYredirector daemon script accepts conventional daemon script commands.

Note: This information is provided as an FYI for administrators. In typical situations, it is not necessary to use these commands.

/etc/rc.d/init.d/ttyredirectord start|stop|restart|status

> start — Start the daemon.
>
> stop — Stop the daemon.
>
> restart — Stop then start the daemon.
>
> status — Display (to stdout) PID and current status.

Using TTYredirector

The Command Line Utilities

The ***trconfig*** command configures TTYredirector and its devices in three ways:

- You can <u>manage tty devices</u> by adding them, removing them, configuring their options.
- You can specify how TTYredirector will <u>initialize remote ports</u> if you are using device servers that support the Telnet protocol with RFC 2217 extensions.
- You can set <u>general options</u> that affect all TTYredirector tty devices.

The ***trquery*** command lets you <u>display current settings</u> by using many of the same command options as *trconfig*.

The ***trtrace*** command is a troubleshooting tool that provides a real-time <u>display of tty device activity</u> to help diagnose application problems.

Using TTYredirector

Managing tty Devices

The following *trconfig* commands add, delete, and manage the basic settings for individual tty devices controlled by TTYredirector.

In all commands below, *dev* specifies TTYredirector tty devices and can be:

A single device name composed of A-Z, a-z, 0-9, +, -, and underscore,

or

multiple device names separate by commas, with no spaces between,

or

the value ALL, signifying all existing TTYredirector devices, can be used except with the -addtty, -deltty and -ttylist options.

Short forms of option names appear on a line following the long form.

For the status values returned by *trconfig*, see the Technical Notes.

Adding and deleting TTYredirector tty devices

trconfig -addtty *dev*

Adds new TTYredirector tty device(s) in the /dev directory.

All settings for new device(s) are default values.

If a device exists, there is no error.

No other options can be used with this command.

Note: The Linux kernel limits the number of Unix98 pty devices to a maximum of 2048, and most Linux distributions are configured for 256 by default. Since pty devices are used for various purposes, the number available to be used by TTYredirector will be lower, depending on what other software is running at the time.

trconfig -deltty *dev*

Deletes the TTYredirector tty device(s).

If a device does not exist, there is no error.

No other options can be used with this command.

trconfig -ttylist *dev*
trconfig -l *dev*

Forces the set of TTYredirector tty devices to be exactly *dev*, adding them as necessary.

Existing tty devices not in *dev* are deleted.

No other options can be used with this command.

Location of the networked device

```
trconfig -tty dev -server IP-addr -port TCP-port
trconfig -y dev   -s IP-addr       -p TCP-port
```

IP-addr — A numeric IP address *xxx.xxx.xxx.xxx* or a hostname of the device server

TCP-port — The TCP port number at which the device server accepts connections for the specific device

Protocol supported by the device server

```
trconfig -tty dev -protocol tcp|telnet|telnetcr
trconfig -y dev   -o tcp|telnet|telnetcr
```

tcp — Raw TCP connections only (default value)

telnet — Telnet protocol, with or without RFC 2217 extensions

telnetcr — Telnet protocol with CR padding

Automatically login to device server

```
trconfig -tty dev -auth username|none
trconfig -y dev   -a username|none
```

username — At the beginning of a connection, attempt to detect and respond to a login prompt from the server asking for a user name.

none — Do not detect any server login prompt. (default)

```
trconfig -tty dev -username name -password pwd
trconfig -y dev   -u name        -w pwd
```

username — Use this name to respond to a username prompt.

pwd — Use this password to respond to a password prompt.

Automatically restoring failed connections

```
trconfig -tty dev -restore Y|N
trconfig -y dev   -r Y|N
```

Y — If the network connection to the server fails, attempt to restore it and continue operation. For more information, see the Technical Notes.

N — Do not restore a failed connection. (default)

Permissions

```
trconfig -tty dev -chown owner -chgrp group -chmod mode
trconfig -y dev    -chown owner -chgrp group -chmod mode
```

Sets permissions for using the tty devices.

Any combination of *chown*, *chgrp* and *chmod* options can be used.

owner and *group* must exist. Default settings for both depend on the version of Linux being used.

mode is 3 digits following the UNIX chmod convention for setting read and write permissions for owner, group, world. The default setting is 666, providing access for all users. Allowed values for each digit are:

0 — no access
6 — read and write access

If the *tty* option is omitted, settings for *chown*, *chgrp* and *chmod* options modify the default used for any tty device that has not been given its own setting using the *tty* option.

Resetting and copying device settings

```
trconfig -tty dev -reset
```

All options for the tty devices are set to default values.

This command does not affect the settings of general options.

Note: No other command options can be used.

```
trconfig -tty dev -copyfrom source-dev
trconfig -y dev    -c source-dev
```

All option settings for the *source-dev* device are copied to all devices specified by *dev*.

No other options can be used with this command.

Using TTYredirector

Initializing Remote Ports

If you are using a device server that supports the Telnet protocol with RFC 2217 extensions, TTYredirector is able to improve your access to server devices in three ways:

1. Each time you open a TTYredirector device, the corresponding remote port on the server can be initialized to your settings for baud rate, data length, and the other options described below.

2. TTYredirector throttles the output data rate (from the client computer to the device server) to match any specified baud rate for the tty.

3. TTYredirector cooperates with the device server to manage the flow of data between the client computer and the server to prevent overrun conditions.

The potential benefit of using a server that supports RFC 2217 is compatibility with certain applications that require more control of serial ports.

Please note:

- The default settings for these options is to have no effect on the server. If you do not use these commands, the corresponding settings on the device server are not affected. Effectively, the settings on the server are the default settings.

- The *dev* parameter in the commands below follows the rules specified in Managing tty Devices.

- If an option is specified without a value, the setting is the default value for the option.

- Short forms of option names appear on a line following the long form.

- These options can be combined in any order in a single command.

- For the status values returned by *trconfig*, see the Technical Notes.

Speed (baud rate), length, parity, stop bits

```
trconfig -tty dev -speed b
trconfig -y dev    -E b
```

> *b* — Baud rate: any positive integer, with common values being 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

```
trconfig -tty dev -length n
trconfig -y dev    -L n
```

> *n* — Data length: 5, 6, 7 or 8

```
trconfig -tty dev -parity p
trconfig -y dev    -P p
```

> *p* — Parity: even, odd, mark, space, none

```
trconfig -tty dev -stop s
```

```
trconfig -y dev    -S s
```

   s — Stop bits: 1, 1.5, 2

DTR / RTS line status

```
trconfig -tty dev -dtr d
trconfig -y dev    -D d
```

   d — 0 or 1, the state to set when the tty is opened

```
trconfig -tty dev -rts r
trconfig -y dev    -T r
```

   r — 0 or 1, the state to set when the tty is opened

Flow control

```
trconfig -tty dev -inflow i
trconfig -y dev    -I i
```

   i — Input flow control: rts, dtr, xonxoff, none

```
trconfig -tty dev -outflow o
trconfig -y dev    -O o
```

   o — Input flow control: cts, dsr, xonxoff, none

Using TTYredirector

General Options

The general options affect all TTYredirector tty devices.

Please note:

- When using general options, do not specify TTYredirector tty devices.
- Single-letter forms of option names appear on a line following the long form.
- Option names can be shortened as long as they are not ambiguous.
- Unless otherwise noted, these options can be combined in any order in a single command.
- For the status values returned by *trconfig*, see the Technical Notes.

The client/server network connection

```
trconfig -nagle Y/N
trconfig -g Y/N
```

Controls use of the Nagle algorithm, which coalesces data into fewer network packets. In some applications, latency needs to be improved (at the expense of somewhat higher network loading) by disabling the Nagle algorithm to use more frequent packets that each hold less data. For more information, see the Technical Notes.

Default setting: Y

```
trconfig -keepalive n
trconfig -k n
```

n — The number of milliseconds between keep-alive transmissions. A value of at least 1000 is recommended.

Default setting: 60000 (60 seconds).

If the device server supports Telnet protocol with RFC 2217 extensions, TTYredirector can use a keep-alive message method to detect a failed connection to the server. This option controls the interval at which TTYredirector will issue the keep-alive message, if no activity has occurred on the connection. For more information, see the Technical Notes.

```
trconfig -timeout n
```

n — The number of milliseconds the daemon will wait for an answer to a keep-alive message before the connection to the server is considered a failed connection. A value of at least 1000 is recommended.

Default setting: 30000 (30 seconds).

See the description of the keepalive option above for additional information.

```
trconfig -maxreconnect m
trconfig -m m
```

> *n* — The number of milliseconds between reconnect attempts. A value of at least 1000 is recommended.
>
> Controls the maximum time between attempts by TTYredirector to reconnect to the server if `-restore` is enabled for a tty.
>
> Default setting: `30000` (30 seconds).

```
trconfig -delayclose c
trconfig -C c
```

> *c* — The number of milliseconds to delay closing the connection to the server after the tty device has been closed.
>
> Default setting: `8000` (8 seconds).

```
trconfig -sync Y/N
trconfig -Y Y/N
```

> If set to `Y`, the tty device does not transmit data to the server until the Telnet protocol (if used) is fully negotiated and server login (if enabled) is complete (if enabled). If the server uses raw TCP and does not require login, this option has no effect.
>
> Default setting: `N`

```
trconfig -limitrate Y/N
trconfig -R Y/N
```

> If set to `Y`, the outbound data rate to the device server is throttled to match the baud rate in effect for the tty device.
>
> If the server supports Telnet with RFC 2217 extensions, this feature is enabled regardless of the setting of this option.
>
> Default setting: `N`

Server login

```
trconfig -authterm term
trconfig -M term
```

> *term* — The character(s) that TTYredirector will append to the username and password when responding to prompts from a device server.
>
> Settings can include:
>
> > `\n` — linefeed
> >
> > `\r` — carriage return
> >
> > `\t` — tab

Remember to quote the \ character in shell commands:

```
trconfig -authterm '\r'
```

Default setting: `\n`

`trconfig -login` *lp* `-pwd` *pp*

Specifies additional login and password prompt strings that TTYredirector looks for if automatic login is enabled (see the `-auth` option).

Either or both options can be used.

lp — One or more strings (separated by vertical bar) specifying additional login prompt strings.

pp — One or more strings (separated by vertical bar) specifying additional password prompt strings.

The built-in login prompt strings are:

`login: |username: |Username:|login :|Login:|user:|`

The built-in password prompt strings are:

`password:|Password:|Enter PASSCODE|`

License key

`trconfig -licensekey` *lk*

Replaces the license key being used by TTYredirector.

lk — A TTYredirector license key `xxxx-xxxx-xxxx-xxxx-xxxx`

The license key is not case-sensitive and dashes are optional.

The new license key is effective immediately.

No other options can be used with this command.

Reset

`trconfig -reset`

Changes all global options to default settings.

This action differs from using `-reset` with a list of devices.

No other options can be used with this command.

Using TTYredirector

Displaying the Settings

The *trquery* command displays the settings of all tty options and general options.

Additionally, *trquery* displays other information including the end-user license agreement and the version of the TTYredirector software.

Please note:

- The *dev* parameter in the commands below follows the rules specified in <u>Managing tty Devices</u>.

- Options can be combined in any order in a single command.

- For the status values returned by *trconfig*, see the <u>Technical Notes</u>.

Option Settings

```
trquery -tty dev -opt1 -opt2 ...
trquery -y dev    -opt1 -opt2 ...
```

opt1, opt2, ... — tty options to be displayed, including all tty options that can be set with a *trconfig* command:

```
 -server          -port            -protocol         -auth
 -s               -p               -o                -a

 -username        -password        -restore
 -u               -w               -r

 -chown           -chgrp           -chmod

 -speed           -length          -parity           -stop
 -E               -L               -P                -S

 -dtr             -rts             -inflow           -outflow
 -D               -T               -I                -O

 -nagle           -keepalive       -maxreconnect     -delayclose
 -g               -k               -m                -C

 -sync            -limitrate       -authterm
 -Y               -R               -M

 -login           -pwd             -licensekey
```

If options are omitted, settings of all options are displayed.

If the -tty option is omitted, the settings of general options are displayed.

Version and License Information

```
trquery -version
```

Displays the version of the TTYredirector software.

```
trquery -help license|about
```

license — The end-user license agreement.

about — General information about the TTYredirector software installed on the local computer, including the software version, the license key, the number of licensed devices, and any license expiration date.

```
trquery -help license|about
```

license — The end-user license agreement.

about — General information about the TTYredirector software installed on the local computer, including the software version, the license key, the number of licensed devices, and any license expiration date.

Using TTYredirector

Technical Notes

Restoring Failed Connections

The `-restore` option is enabled to make TTYredirector attempt to restore a failed network connection to a device server.

When the `-restore` option is set to `N`:

- TTYredirector takes no independent action to re-establish a failed connection.

- The connection to the server will not be restored until the application closes and reopens the tty device.

When the `-restore` option is set to `Y`:

- When TTYredirector notices that the TCP connection is broken, it will immediately attempt to reconnect to the device server.

- If that attempt fails, TTYredirector tries again at increasing intervals until the connection is restored or the application closes the tty device.

- The maximum interval between attempts is determined by the setting of the advanced option `-maxreconnect`.

The `-restore` option should be used if the application can continue normal operation if a failed connection is automatically restored. Whether this is possible depends on:

- What has happened on the server when the connection failed? Is the device still in an operable state?

- If TTYredirector reconnects, will it get the same device?

- Can the application tolerate a delay in detecting the failed connection and the time it takes to reconnect?

The Keepalive Interval

One of the basic characteristics of a TCP/IP connection is that one end of the connection may fail without automatic notification to the other end.

If the `-restore` option is enabled on any TTYredirector tty devices, and if Telnet with RFC 2217 extensions protocol is being used, the TTYredirector periodically emits a "keep-alive" message to the server, which responds with an acknowledgement. This action monitors the existence of the connection. The interval between attempts by the redirector to reach the server is 60 seconds by default. This means that as much as 60 seconds may elapse before the redirector discovers that the connection has failed.

To shorten the maximum time of an undetected failure, a smaller value for the keepalive interval can be used by change the setting of the `-keepalive` option. The penalty of shorter intervals is increased network traffic and overhead on the local computer and server.

Limiting the Data Rate

Because TTYredirector is relaying data to the server over a network connection, the rate at which it sends data to the server can be network speed until various buffers fill in the local computer, the network, and/or the server software. Consequently, the application using TTYredirector may incorrectly assume that all data has been sent by the serial device because all writes to the local TTYredirector tty device have completed. This is not a problem for most applications.

If the server supports the Telnet protocol with RFC 2217 extensions, the server is able to exercise control over the rate at which the redirector sends data. Otherwise, if the `-limitrate` option is disabled, TTYredirector ignores that baud rate setting and lets the server accept data as quickly as it can.

The Nagle Algorithm

The purpose of the Nagle algorithm is to provide better network efficiency while imposing a minor latency on the data stream while it waits to fill network packets. For most applications, this effect is transparent.

For applications that are especially sensitive to data timing, however, the Nagle algorithm may cause application errors that can be solved by disabling the `-nagle` option. Examples include applications that send short messages and wait for an acknowledgement.

Command Status Values

The following error numbers can be returned by *trconfig*, *trquery* and *trtrace*.

0 The specified option wasn't recognized. I.e., "trquery -foobarbaz".

1 An option was recognized, but it was being used out of context. An example is a command that contains -tty (valid for tty configuration options) along with a general configuration option like -keepalive.

2 A value is illegal. An example is "trconfig -tty "nonsense value".

3 The command has been rejected by the TTYredirector daemon. An example is setting a user permission for a user that doesn't exist.

4 The command program is unable to communicate with the ttyredirectord daemon.

Troubleshooting

Tracing tty Activity

The *trtrace* command displays the activity of TTYredirector tty devices.

Initiating tracing

trtrace

>Displays trace data to stdout.

trtrace -outputfile *file*
trtrace -f *file*

>Writes trace data to *file*, replacing the file if it exists.

>If *file* is preceded by a '+', the output is appended to file.

>If *file* is '-', output is send to *stdout*.

>Multiple -outputfile options are permitted. A copy of *trtrace* ouput will be written to each file.

>Example 1:

>>trtrace -outputfile trace.txt -outputfile -

>writes output both to the trace.txt and *stdout*.

>Example 2:

>>trtrace -f +history.txt -f current.txt

>appends output to history.txt and writes to a new file current.txt.

Troubleshooting

Messages in syslog

The TTYredirector daemon emits error and information messages to the operating system's syslog facility. Each message is tagged with "ttyredir" and either "ERROR" or "INFO" depending on the nature of the message.

Events that result in syslog messages include:

- Daemon startup and shutdown
- Errors in creating or opening a tty device
- License conflicts
- Invalid or missing license key
- Maximum number of licensed tty's exceeded