



TRAFFICJAM

NETWORK TRAFFIC GENERATOR

USER'S GUIDE

*Firmware Version 1.0*



APPOSITE  
— TECHNOLOGIES

# TrafficJam Network Traffic Generator User's Guide

Revision 1, September 2018

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Part No. TJ1G

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# 1 OVERVIEW

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Thank you for purchasing the Apposite Technologies TrafficJam Network Traffic Generator. This *User's Guide* describes the installation, configuration, and operation of the TrafficJam functionality. Please consult the companion *Hardware Guide* for information on the TrafficJam hardware. A separate *Quick Start Guide* provides a walk-through for first time configuration.

## 1.1 TrafficJam Product

The TrafficJam is a portable, low cost network traffic generation tool designed to generate stateful TCP connections or UDP streams for testing the performance of network equipment, routing protocols in conjunction with traffic load, as well as network capacity. Their small size and light weight make them easy to carry, while their fanless design and solid-state storage offer extra reliability for frequent shipping.

## 1.2 TrafficJam Operation

The TrafficJam creates network traffic on live or lab networks. Depending on configuration, the TrafficJam can work as a standalone unit or link with other TrafficJams on the network. Frames sent from Port 1 can be received on Port 2 (Standalone) & vice versa or can be received on a separate TrafficJam's Port 1 or 2 (Linked).

## 1.3 TrafficJam Configuration

Configuration of the TrafficJam is primarily through the browser-based TrafficJam GUI (Graphical User Interface). The GUI is accessible from any PC or other device with a standard web browser. Management connectivity is via a dedicated Ethernet management interface on the TrafficJam. See Section 3 for more information on the TrafficJam GUI.

In addition to the GUI, the TrafficJam includes a limited command line interface (CLI) that can be accessed via the console serial port or over the network using Telnet or SSH. The CLI is used primarily to set the management IP address if the GUI is not accessible over the network. See Section 11 for details on the CLI.

# 2 GETTING STARTED:

## INSTALLING THE TRAFFICJAM NETWORK TRAFFIC GENERATOR

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The TrafficJam is managed through a browser-based GUI over an Ethernet connection to a dedicated management interface. Prior to operation, this management interface must be configured with appropriate network settings, either through the TrafficJam GUI or through the command-line interface accessed via the serial console. For convenience, the management interface comes preconfigured with an IP address of 10.0.0.10, and the GUI is accessible from a directly-connected host on the 10.0.0.0/255.0.0.0 subnet.

### Preparation

Management of the TrafficJam requires a PC running a supported web browser (Internet Explorer, Firefox, and Chrome). JavaScript must be enabled.

Initial configuration of the management interface requires either:

- ▶ a PC running a supported web browser that can be configured and placed on the 10.0.0.0/255.0.0.0 network.
- ▶ a PC with an RS-232 serial port running terminal emulation software such as HyperTerminal or PuTTY.

### Hardware Installation

Plug in the supplied AC to DC power adaptor to the DC power input on the back of the unit. The Power LED on the front panel will glow green and the system will be available for use within 60 seconds.

For additional hardware installation details, please see the *TrafficJam Hardware Guide*.

## IP Address Configuration via the TrafficJam GUI

To configure the management interface using the TrafficJam GUI:

- 1 Configure a PC running a supported web browser with the IP address 10.0.0.2 or other address on the 10.0.0.0/255.0.0.0 subnet.
- 2 Connect an Ethernet cable between the PC and the MGMT port of the TrafficJam.
- 3 Open the browser on the PC and enter `http://10.0.0.10` (the preconfigured management address) in the address bar. The TrafficJam End User License Agreement will be displayed in a separate window.
- 4 Review the License Agreement. The TrafficJam GUI will be displayed once the License Agreement is accepted.
- 5 The TrafficJam GUI will open to the **Administration** tab. If desired, modify the Hostname, Domain, IP address, netmask, and default gateway for the management interface. Click the *Apply Changes* button when done.

### IP Address Configuration via the Serial Console

Using the provided DB-9 cable, connect the serial port of a PC running terminal emulation software to the CONSOLE port of the TrafficJam. Set the serial port parameters to 9600 baud, 8 bits, no parity, 1 stop bit, and disable flow control. For more details on connecting to the serial console, see the *TrafficJam Hardware Guide*.

Press [ENTER] to display a login prompt. At the prompt, log in as "admin". There is no password.

```
TrafficJam login: admin
```

Use the following commands to set the IP address, IP netmask, and default gateway of the TrafficJam management interface:

```
mgmt set addr <interface-ip-address> netmask <ip-netmask>
```

```
mgmt set gw <default-gateway>
```

IP addresses and netmasks are entered in dotted-decimal format. For example:

```
TrafficJam> mgmt set addr 192.168.1.1 netmask 255.255.255.0
```

- 6 Once the management interface has been configured, use the Ethernet cable to connect the MGMT port to the management network.

## Operation

The TrafficJam Port 1 should be connected to one side of the network you wish to test and given an IP address that is valid for that network. Port 2 should be connected to the opposite side of the network you wish to test and assigned a valid IP address. Routing may be needed to allow the two ports to pass traffic. The traffic will now flow from either port traversing the test network.



## Registration

For access to firmware upgrades, documentation, and other support materials, register your unit on-line at: <http://www.apposite-tech.com/register.html>.

Registered users will receive email notification whenever new firmware images are released.

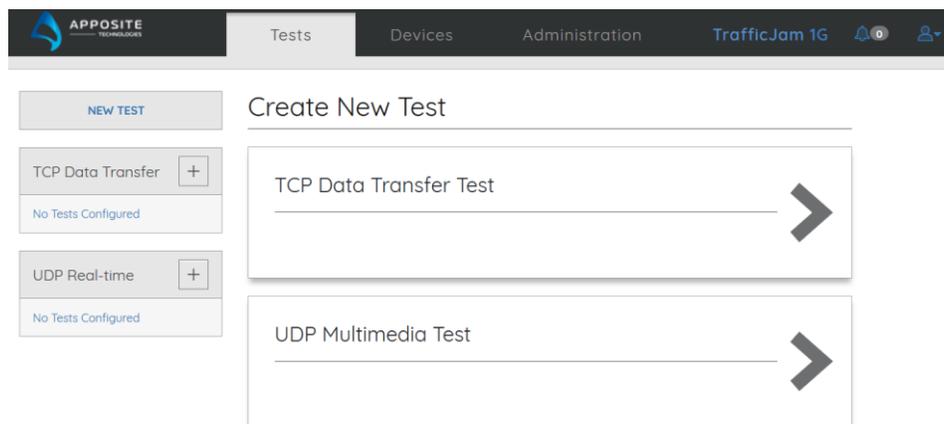
# 3 TRAFFICJAM GUI

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## 3.1 Overview

The browser-based TrafficJam GUI is the primary configuration interface for the TrafficJam. The GUI is compatible with Internet Explorer, Firefox, and Chrome. JavaScript must be enabled. The GUI is accessible via HTTP.

The TrafficJam GUI consists of Tests, Device, and Administration tabs.



**Figure 2: Tests Tab**

- The Tests tab shows existing tests that are configured.
- The Device tab allows for configuring devices and ports.
- The Administration tab is for administration duties such as setting hostname, management network address, and passwords.

Sections 4 through 6 of this User's Guide describe each of the individual tabs.

Alerts will be shown at the top of the screen and will be visible when status messages are displayed.

# 4 TESTS TAB:

## TESTS OVERVIEW

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The **Tests** tab is comprised of a left navigation menu and a main view. There are two types of traffic that can be generated, TCP and UDP. Tests are created by clicking the '*New Test*' option from the left navigation menu and choosing one of the options, or by clicking the '+' button next to their respective test.

Once a test is created, the GUI will automatically navigate to the newly created test and display the test configuration on the main view. A test configuration is comprised of:

- Test Name & Controls
- Test Options
- Status Bar
- Statistics

## 4.1 Test Name & Controls

The top row of the Test Configuration has the test name and controls.

The test name can be changed by clicking the [insert pencil icon] pencil icon. It will be set after hitting enter or clicking away. Keep in mind the test name will not be saved until the test configuration is saved.

The test controls are:

[insert start icon]: the start button. When clicked, the TrafficJam will validate the test configuration, save the test configuration, and then start the test. If an erroneous configuration is present, notifications will appear.

[insert stop icon]: the stop button. When clicked, the TrafficJam will stop the test.

[insert save icon]: the save configuration button. When clicked, the TrafficJam will validate and then save the configuration. If an erroneous configuration is present, notifications will appear.

Note: The configuration will also be saved automatically when navigating to another portion of the GUI. This configuration will not be saved when refreshing the page or navigating to an external site.

[insert download icon]: the download configuration button. When clicked, the TrafficJam will save the current configuration to a text file with JSON formatted text that can be uploaded to a test of the same type (TCP / UDP).

[insert upload icon]: the upload external configuration button. When clicked, will show an option to load an external configuration file into the currently viewed test. The configuration file needs to be of the same test type (TCP / UDP).

## 4.2 Test Options

The Test Options consist of endpoint definitions and unique TCP / UDP options. These are also categorized as basic and advanced options. Basic options are always visible. Advanced options, which generally only need adjustment for specialized conditions, are hidden by default. To display the advanced parameters, click the *'Advanced Options'* link. Click the *'Advanced Options'* link to hide them again if desired.

Basic options are the endpoints, TCP / UDP options, and test duration. The advanced options are additional TCP / UDP options. The differences between these two test types will be covered in a later section.



Advanced parameter settings are used in the emulation, even if the parameters are hidden.

There are two endpoints, Source and Destination. These are defined by the physical TrafficJam Ethernet port, and an IP address. If an IP address has not been defined for that port, an alert will be shown. Clicking this alert will redirect the GUI to the appropriate Device port where IP can be defined. The Destination endpoint has an additional field for TCP/UDP port. This value can be from 0 to 65535.

There is a [insert ping icon] ping icon, which when clicked will navigate the GUI to the ping tool for the relevant Device port.

## 4.2.1 TCP Options

The TCP options available are:

- Parallel streams: There can be 1 to 20 parallel streams. By default, this value is 1.
- IP DSCP: the DSCP header can be a value from 0 to 63. By default, this value is 0.
- IP MTU: Maximum transmission unit can be a value from 68 to 65507 bytes. By default, this value is 1500 bytes.
- TCP Receive Window: This can be a value from 4096 B to 1 GB. By default, this value is 2 MB.
- TCP Congestion Control: Options available are CUBIC, New Reno, Vegas, Westwood, HighSpeed, Hybla, and Illinois. By default, this value is CUBIC.
- TCP Nagle: This can be enabled or disabled. By default, this feature is enabled.
- Transmit Data: The data sent can be zeroes, ones, or a random combination. By default, the values are zeroes.

## 4.2.2 UDP Options

The UDP options available are:

- Parallel streams: There can be 1 to 20 parallel streams. By default, this value is 1.
- Datagram Size: This value can be from 24 to 65507 bytes. By default, this value is 56 bytes. This value cannot exceed the MTU.

- **Transmit Rate:** This rate can be 1 Mbps to 1 Gbps. It can also be set to a value from 1 packet per second to 30,000 packets per second.

NOTE: UDP has a limitation in packets per second, so to reach higher bitrates, a large datagram size is required.

- **IP DSCP:** the DSCP header can be a value from 0 to 63. By default, this value is 0.
- **IP MTU:** Maximum transmission unit can be a value from 68 to 65507 bytes. By default, this value is 1500 bytes.
- **Transmit Data:** The data sent can be zeroes, ones, or a random combination. By default, the values are zeroes.

### 4.2.3 Duration

The duration of the test can be unlimited or have a set time limit. The maximum set time limit allowed is 24 hours. If the test is required to go past one day, it is recommended to use unlimited.

TCP tests have an extra option to stop based on how many bytes are received. The maximum amount is 10,800 GB.

UDP tests have an extra option to stop based on how many datagrams are sent. The maximum amount is 6,912,000,000 packets.

## 4.3 Status Bar

The Status Bar contains the status of the test, the elapsed time, and a link to the Results page. The elapsed time is the total test time, not only the duration of traffic being sent. This means the elapsed time includes the time it takes to start and stop the test on the clients and server.

### 4.3.1 Test Logs

There is a [insert logs icon] log icon next to the test status. This will open a log showing messages pertaining to that test. There is a global log available in the top menu, which can be accessed by clicking the [insert bell icon] alerts icon. The log list will include commands given and any errors encountered.

## 4.3.2 Results

The Results page has information about numerous statistics of the test. The Results page is only accessible once a test is stopped. Clicking the [insert result icon] will open a pop-up page containing the test results.

The Results page is comprised of a test summary and graphs. There is a [insert print icon] print-friendly toggle in the header of the page. Clicking this icon will shrink the page to fit appropriately on a letter size page.

Note: Internet Explorer will not scale correctly and will require some adjustments during the print preview process.

The test summary has information on the endpoint definitions, test time, test options, and general information on aggregate and per stream statistics. The graphs have more detailed information on the aggregate and per stream statistics versus time.

The statistics page can be long, so after scrolling down, a clickable icon will appear that goes back to the top of the page.

The Results page can only be closed by the X icon in the header.

## 4.4 Statistics

The Statistics section has a data table with information per stream and graph(s) with aggregate information. The information available is different per test type.

Do note that throughput is based on what is received and is not reporting what is sent out.

TCP Data Table:

Source IP and Port

Throughput (bps)

Transferred Bytes (bytes)

Retransmits (packets)

Congestion Window (bytes)

Stream State

UDP Data Table:

Source IP and Port

Transferred Bytes (bytes)

Jitter (ms)

Packets Sent (packets)

Packets Lost (percent and packets)

Stream State

TCP Graph:

Throughput (bps)

UDP Graphs:

Throughput (bps)

Lost Packets (packets)

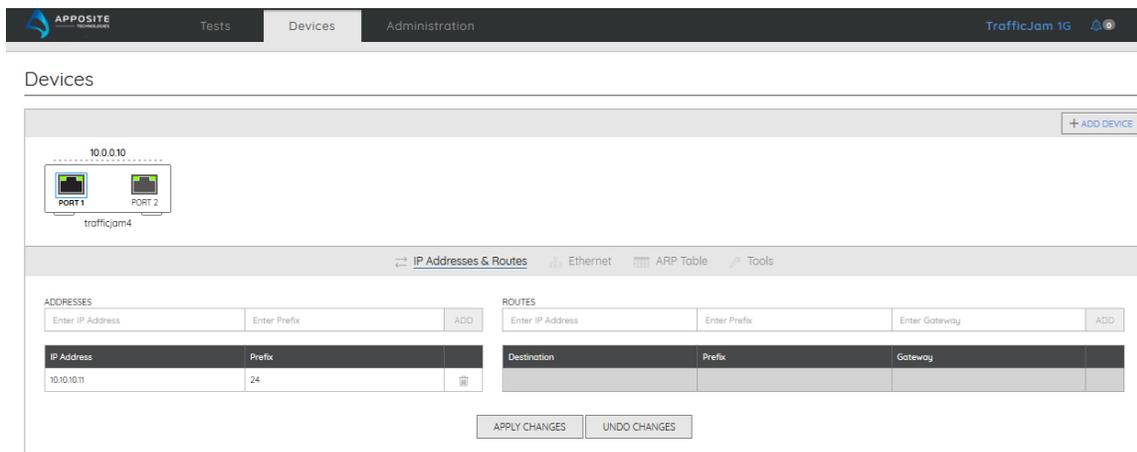
# 5 DEVICES TAB: PORT CONFIGURATIONS

The TrafficJam has two ports for generating and receiving traffic Port 1 & 2. These ports need to be assigned to the network/networks that traffic will be traversing. This is done by assigning the ports IP Addresses, and network prefixes. Connections to other TrafficJam Devices on the network can be configured in the **Devices** tab.

## 5.1 IP Addresses & Routes

The **Devices** tab will list all the devices the unit is connected to. If it is a standalone unit then only itself will be shown/listed.

Click on Port 1 or 2 on the device you would like to configure or change.



**Figure 3: Port Configuration**

Under the **ADDRESSES** column assign an IP address and network prefix in this window and "Apply Changes." The network prefix is represented by integers 0-32.

*For example, IP Address 10.10.10.10 with a subnet of 255.255.255.0 would be 10.10.10.10/24. "24" is the network Prefix.*

Add routes by entering the IP Address, the prefix, and the gateway you wish to route the traffic to. Under the **ROUTES** column.

## 5.1.2 Ethernet

The “Ethernet” link in **Devices** tab shows the link status, duplex settings, transfer statistics, receive statistics, and errors on the port. Hard set the speed and duplex by using the “Speed/Duplex” dropdown.

## 5.1.3 Arp Table

The “ARP Table” link in the **Devices** tab shows Address Resolution Protocol information including IP Address, Link Layer (MAC Address), and state. Removing the ARP entry is done by clicking on the garbage can icon to the right of the entry.

## 5.1.4 Tools

The “Tools” link in the **Devices** tab has the networking tools ping and traceroute.

To ping, choose which port/source address to ping from and the IP/Hostname of the destination and click start. The results will be displayed in the box below.

To traceroute, choose which port/source address to trace from and the IP/Hostname of the destination and click start. The results will be displayed in the box below.

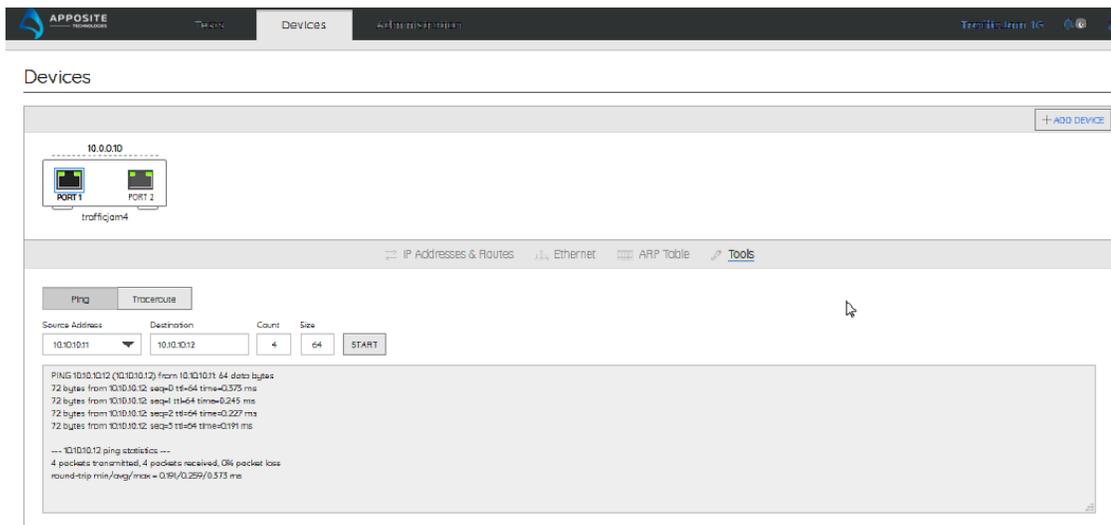


Figure 4: Ping Example

## 5.2 Add device

Click the “Add Device” button in the **Devices** tab to administer other available TrafficJams. Enter the IP Address or hostname and choose ADD. If successful, the new TrafficJam will be displayed in the **Devices** tab.

# 6 ADMINISTRATION TAB:

## MANAGEMENT PARAMETERS

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The TrafficJam hostname, interface settings, and firmware are configured on the **Administration** tab. Settings are saved by pressing the *Apply Changes/Set Password* button on the bottom of the **Network Settings** and **Password** boxes. Status shows the current network settings for the device. Firmware shows the current version of firmware, serial number, and firmware upgrades.

Settings remain unchanged through reboots and power cycles.

The screenshot displays the 'Administration' tab of a web interface. On the left is a vertical sidebar with three menu items: 'Settings' (highlighted), 'Status', and 'Firmware'. A mouse cursor is positioned over the 'Settings' item. The main content area is titled 'Administration' and contains two sections:

- Network Settings:** This section contains several input fields and a dropdown menu:
  - Hostname: trafficjam4
  - Domain: apposite-tech.com
  - DHCP: Disabled (dropdown menu)
  - IP Address: 192.168.168.185
  - IP Netmask: 255.255.255.0
  - Default Gateway: 192.168.168.1
  - DNS Servers: 8.8.8.8
  - NTP Servers: 0.us.pool.ntp.orgAt the bottom of this section are two buttons: 'APPLY CHANGES' and 'CLEAR CHANGES'.
- Password:** This section contains two input fields and a checkbox:
  - New Password: Enter Password
  - Verify Password: Repeat Password
  - Show Password:At the bottom of this section are two buttons: 'SET PASSWORD' and 'REMOVE PASSWORD'.

Figure 5: Administration Tab

## 6.1 Hostname

The name of the TrafficJam unit is displayed and changed here.

## 6.2 Domain

Set the domain that the management port will be assigned to. This is not a required field.

## 6.3 DHCP

To use Dynamic host configuration protocol set this to “enable.” If you wish to use manual (static) addressing set this to “disable”

## 6.4 IP Address, IP Netmask, and Default Gateway

Set the IP Address, network subnet, and gateway address here if you are using a static address. If you do not wish to manually assign networking information you can use DHCP.



If you cannot regain connectivity to the TrafficJam after a change to the network settings, use the CONSOLE interface to verify or change the network settings.

## 6.5 DNS Servers

Add the IPs of the Domain Name Servers to be used. Add more than one by separating with a “,” (Example: 8.8.8.8, 8.8.4.4).

## 6.6 NTP Servers

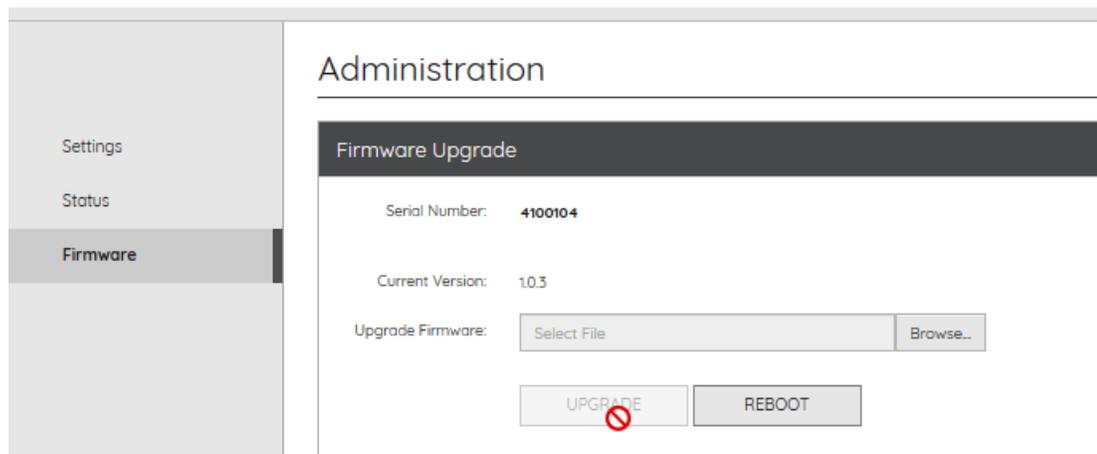
Network Time Protocol can be used by entering the hostname or IP Address of a valid NTP server. This is not a required field.

## 6.7 Status

On the left side navigation column there is a **Status** option. This shows the current network status and setting of the TrafficJam.

## 6.8 Firmware

On the left side navigation column there is a **Firmware** option. In this area you can find your serial number, code version, upload new firmware, and reboot.



**Figure 6: Firmware Screen**

# 7 SECURITY

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## 7.1 Passwords

To change the password, navigate to the **Administration** tab. Select **Settings** on the left navigation bar. At the bottom of the tab, below the “Network Setting” box, there is a **Password** box.

Enter the new password in the “New password” field and repeat the password in the “Verify Password” field. Use the Show Password checkbox to verify that the passwords match. Click “Set Password” to commit your password to the device.

## 7.2 SSH

The TrafficJam CLI is accessible over the network via SSH. To verify the identity of the TrafficJam SSH server, use the “`ssh fingerprint`” command in the CLI to display the fingerprints of the SSH server’s public keys. You may need to console in to access the CLI.

# 8 COMMAND LINE INTERFACE

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Management and configuration of the TrafficJam is via the TrafficJam GUI. A command line interface (CLI) with a limited feature set is also available and can be accessed via the CONSOLE interface or over the network through a Telnet or SSH connection. The CLI provides the following subset of the functionality available in the TrafficJam GUI:

- ▶ Configure the management IP address, subnet mask, and default gateway.

To access the CLI, log into the device at the prompt as “`admin`”. There is no password.

SSH can be used to either log into the TrafficJam CLI, similar to Telnet, or to execute a single command.

The SSH and Telnet services can be enabled or disabled through the CLI using the `telnet` and `ssh` commands. By default, both are enabled. Multiple simultaneous sessions are allowed.

## 11.1 CLI Command Syntax

Command	Syntax and Description
arp	<pre>arp show</pre> <p>Displays the ARP table.</p>
clock	<pre>clock set &lt;hh&gt;:&lt;mm&gt;:&lt;ss&gt; &lt;YYYY&gt;-&lt;MM&gt;-&lt;DD&gt;</pre> <p>Sets the device's clock</p> <pre>mgmt show</pre> <p>Displays current device time.</p>
help	<pre>help or ?</pre> <p>Displays a list of commands available through the CLI. A question mark after any command displays the command syntax.</p>
http	<pre>http load &lt;certificate file name&gt; &lt;server address&gt; ["tftp"]</pre> <p>Installs an SSL certificate. Uploaded certificate replaces the self-signed certificate supplied in the firmware. If the certificate is not located in the root directory of the HTTP server or TFTP server, the file name must include the full path name.</p> <p>Specify the IP address of the HTTP or TFTP server.</p> <p>By default, HTTP is used to download the firmware image. Specify "tftp" to use TFTP instead.</p>
init	<pre>init config ["nolicense"]</pre> <p>Returns the configuration to factory default settings.</p> <p>Include "nolicense" to also reset the license acceptance.</p> <p>Takes effect upon reboot unless there is a subsequent save of the configuration.</p>
logout	<pre>logout</pre> <p>Logout from the command line interface. Returns user to the login prompt.</p>

mgmt	<pre>mgmt set addr &lt;addr&gt; netmask &lt;mask&gt;</pre> <p>Sets the IP address and netmask of the MGMT interface.</p> <pre>mgmt set gw &lt;addr&gt;</pre> <p>Sets the default gateway of the device.</p> <pre>mgmt show</pre> <p>Displays the IP address and netmask of the MGMT interface and default gateway of the device.</p>
password	<pre>password clear</pre> <p>Removes set password for admin user.</p> <pre>password set</pre> <p>Set password for admin user. CLI will display two prompts requesting for the new password.</p>
ping	<pre>ping &lt;address&gt; [&lt;size&gt;]</pre> <p>Pings from the device to <code>address</code> with the specified sized packets. Use CTRL-C to stop.</p>
reboot	<pre>reboot</pre> <p>Reboots the device. Returns user to the login prompt after reboot.</p>
serialnumber	<pre>serialnumber</pre> <p>Displays the serial number of the device</p>
ssh	<pre>ssh [enable   disable   fingerprint]</pre> <p>Enables or disables SSH service or displays the fingerprint of the SSH server's public keys. If service is disabled, any sessions in progress are terminated. With no argument, 'ssh' reports current status of the service.</p>
telnet	<pre>telnet [enable   disable]</pre> <p>Enables or disables telnet service. If service is disabled, any sessions in progress are terminated. With no argument, 'telnet' reports current status of the service.</p>
upgrade	<pre>upgrade &lt;image name&gt; &lt;server address&gt; ["tftp"]</pre> <p>Upgrades the TrafficJam firmware. If the image is not located in the root directory of the HTTP server or TFTP server, the image name must include the full path name.</p> <p>Specify the IP address of the HTTP or TFTP server.</p> <p>By default, the TrafficJam will use HTTP to download the firmware image. Specify "tftp" to use TFTP instead.</p>
version	<pre>version</pre> <p>Displays the operating firmware version.</p>

# 9 APPOSITE SUPPORT

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If you experience any problem with the TrafficJam hardware, consult the *Hardware Guide* for your model. If you have any questions about the firmware not answered in this *User's Guide*, please check the Apposite Technologies website at <http://www.apposite-tech.com> for updated firmware and documentation. If your question is not answered, please contact Apposite Support.

Purchase of the TrafficJam includes ninety days of support and one year of maintenance and hardware warranty.

If you believe the firmware is not functioning properly, please upgrade to the latest firmware release. If the problem persists, please contact Apposite Support at:

support@apposite-tech.com  
1.310.477.9955 ext. 2

When contacting Apposite Support, please include the following information:

- ▶ TrafficJam model
- ▶ Serial number
- ▶ Your e-mail address and phone number
- ▶ Installed firmware version
- ▶ A detailed description of the problem



Do not attempt to fix any hardware problem yourself. The TrafficJam contains no user serviceable parts. Opening the chassis voids the warranty.

# APPENDIX A: TRAFFICJAM END USER LICENSE AGREEMENT

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The Apposite Technologies (“Apposite”) TrafficJam product includes the TrafficJam hardware (“Hardware”), software embedded in the Hardware (“Software”), including any upgrades, modified versions, updates, additions and copies of the Software, and related explanatory materials (“Documentation”). Collectively, the Hardware, Software, and Documentation are the “Product.”

Conditioned upon compliance with the terms and conditions of this Agreement, Apposite hereby grants you a nonexclusive and nontransferable license to use the Software solely as embedded on the Hardware, and to use the Documentation solely in conjunction with the Software and Hardware.

## **Title and Restrictions**

Apposite retains all right, title and interest in the Software and Documentation. The Software and Documentation are protected by United States and international copyright and other intellectual property laws and international trade provisions. Except as otherwise expressly provided under this Agreement, you shall not directly or authorize any third party to:

- (i) copy the Software, except as necessary for archival or backup purposes only;
- (ii) transfer, assign, sublicense, rent, lease, lend, or otherwise transfer your license rights to any other person or entity;
- (iii) install or use the Software on any computing device other than the Hardware;
- (iv) modify or adapt the Software or Documentation or create derivative works based upon the Software or Documentation;
- (v) reverse engineer, disassemble, decompile, decrypt, or otherwise attempt to derive the source code of the Software, except to the extent otherwise expressly permitted under applicable law notwithstanding this restriction. To the extent required by law, and at your written request, Apposite will provide you with the interface information needed to achieve interoperability between the Software and another independently created program;
- (vi) remove, alter, cover or obfuscate any of the trademarks, trade names, logos, patent or copyright notices or markings, or add any other notices or markings to or on the Software, Documentation, or Hardware without the express written authorization of Apposite.

## **Limited Warranty**

Apposite warrants that for a period of one (1) year from the date of shipment of the Hardware to you (“Warranty Period”), the Hardware will be free of any defects in materials and workmanship under normal use and the Software will perform substantially in accordance with the Documentation. This limited warranty extends only to the original user of the Product. This limited warranty is void if failure of the Hardware or Software to conform to the warranty has resulted from improper installation, testing, misuse, neglect, accident, fire or other hazard, or any breach of this Agreement.

Apposite and its suppliers' entire liability and your sole and exclusive remedy shall be, at Apposite's sole discretion, to (i) repair the Software or Hardware; (ii) provide replacement Hardware or Software; or (iii) refund the purchase price and terminate this Agreement. This limited warranty applies only if the product is returned to Apposite, freight and insurance prepaid, in accordance with Apposite's Return Material Authorization (RMA) procedures. Any repaired or replaced Software or Hardware will be warranted for the remainder of the original Warranty Period or thirty (30) days, whichever is longer.

### **Disclaimer of Warranties**

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