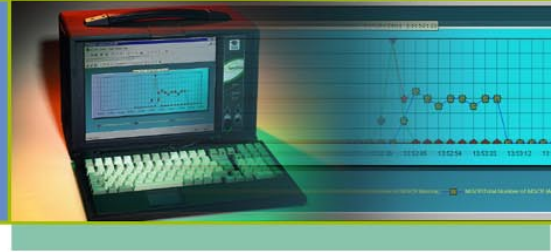# SIP Traffic Generator v. 2.02

From Inet Technologies, Inc.

SIP Traffic Generator

The SIP Traffic Generator is a feature of the Spectra2 Media Gateway (MG) ™ Application Suite. The SIP Traffic Generator is used for validating VoIP network capacity and performance using the SIP protocol.

This application note outlines the functionality of the SIP Traffic Generator version 2.02 as a testing tool in the VoIP environment for those who use the system, including the targeted testing environment, intelligent protocol functions, SIP registration procedures, and generation specifications.

Testing Environment
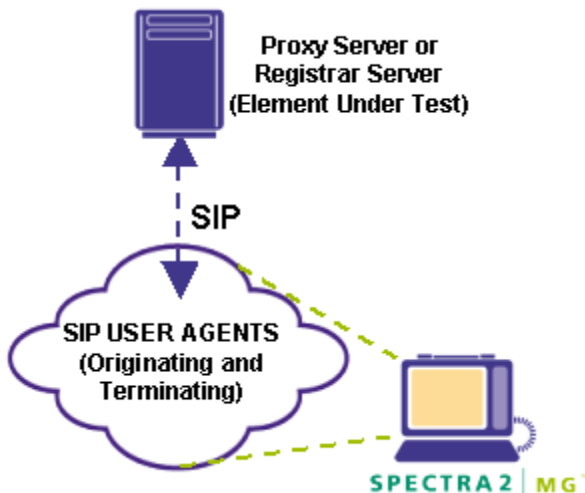
The SIP Traffic Generator tests **one Proxy Server** or **one Registrar Server** by emulating numerous SIP User Agents (UAs). The SIP Traffic Generator does not test Redirect Servers or Proxy Servers in Redirect mode. All calls must originate or terminate on a single server.

Benchmarks

- Up to 500 calls per second (originating and terminating combined)

- Up to 30,000 simultaneous calls

- Up to 60,000 emulated UAs

- Up to 256 IP Addresses per Signaling and Trunk Interface

- Up to 1,000 IP Addresses system wide on a Spectra2 MG unit

The benchmarks listed above are based on a rackmount Spectra2 MG unit with 4 Signaling and Trunk Interfaces. The benchmarks listed above are not scalable, i.e., additional Signaling and Trunk Interfaces do not increase benchmarks above the levels stated.

Interfaces

The SIP Traffic Generator supports a 10/100 Ethernet connection on each Signaling and Trunk Interface. The Spectra2 MG system supports up to 16 Signaling and Trunk Interfaces.

SIP Registration

The SIP Traffic Generator registers UAs through the use of a First Interval Registration option. The First Interval Registration option, when enabled, uses the first traffic interval to register UAs. If the testing scenario involves SIP registration models, the Traffic Model will keep track of those UAs that successfully register. The Load Percentage of the first traffic interval of the registration script should be set to 100% to ensure that all UAs register before calls are attempted. The SIP Traffic Generator will register all UAs if the Duration of the first traffic interval is sufficient to allow for the registration process. When the First Interval Registration option is disabled, no registration check is made.

Automatic "unregistration" of UAs is not supported in version 2.02 of the SIP Traffic Generator. A separate Traffic Model must be created to "unregister" UAs. Support for automatic "unregistration" of UAs is planned for a future release of the SIP Traffic Generator.

Pre-Configured Generation Scripts

Pre-configured origination and termination scripts, as well as Protocol Data Units (PDUs), are provided with the SIP Traffic Generator for the following testing scenarios:

- Registration
- Answered Call
- No Answered Call
- Busy Call

Additionally, User-Defined generation scripts are easily created using the ping-pong scripting interface of the SIP Traffic Generator. Origination and termination scripts are created through the use of PDUs that are assigned to trigger and transmit commands. Examples of typical SIP origination and termination scripts are depicted below.

Origination Script

Termination Script

SIP Protocol Intelligence

The SIP Traffic Generator automatically populates SIP message parameters with a system-generated value on the Origination side and wraps SIP message parameters to outgoing messages on the Termination side.

Populated Parameters (Origination)

Request URI	Populated with the URI of the Destination UA
TO	Populated with the URI of the Destination UA
FROM	Populated with the URI of the Origination UA
VIA	Populated with information based on the Origination UA
Call ID	Populated with system-generated value
CSeq	Populated with a system-generated value; incremented by 1 for each subsequent command
Content Length	Populated with a value calculated based on the size of the message body

Wrapped Parameters (Termination)

The following parameters are wrapped from incoming messages to outgoing messages on the Termination side:

- **TO**
- **FROM**
- **VIA**
- **Call ID**
- **CSeq**

The user cannot specify **Call ID**, as the SIP Traffic Generator populates the parameter. The Host portion of the Call ID is automatically populated based on the defined UAs.

Content Length is automatically calculated by the SIP Traffic Generator based on the size of the message body. If there is no message body present, the Content Length is set to zero.

The SIP Traffic Generator will wrap multiple **VIA** headers from incoming Requests to outgoing Responses. If the SIP Traffic Generator is initiating the Request and the PDU template has multiple VIA headers, the SIP Traffic Generator will replace all of the VIA headers with a single VIA header valid for the UA.

Traffic Model Configuration

The SIP Traffic Generator provides an intuitive interface for configuring Traffic Model parameters for specific testing scenarios.
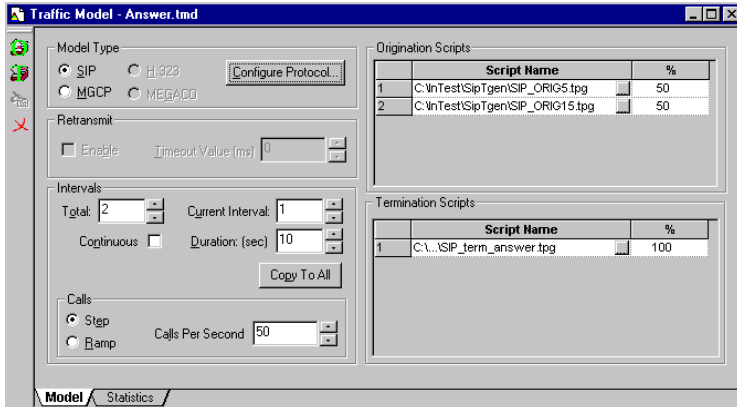
The **Model Type** field allows the user to select the protocol used for generation scenarios. The **Configure Protocol** button accesses a set of User-Definable Traffic Model Parameters specific to the protocol selected. For SIP, this includes the System Under Test, SIP Ports, and UA parameters.

The **Intervals** field allows the user to assign up to 60 traffic Intervals with user-defined duration settings for each interval.

The **Calls** field allows the user to define the calling pattern as Step or Ramp for each interval, as well as the number of Calls per Second. The available calling patterns are depicted in the graph below.
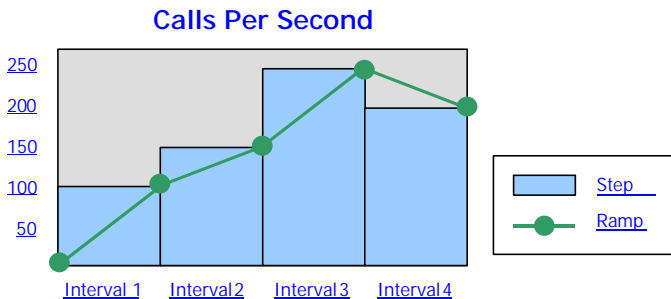
The **Origination and Termination Scripts** fields allow the user to assign up to 10 originating and 10 terminating scripts to each traffic interval. The **Load Percentage (%)** column allows the user to assign the probability of a script's use within the interval. For example, an Origination Script, such as Registration, set to a 100% Load Percentage value in the first interval would be the only script used by the SIP Traffic Generator in that interval.

Statistics

The SIP Traffic Generator provides the statistics listed below for SIP testing scenarios.

General Statistics detail the number of originated scripts run, the number of terminated scripts run, and the number of failed scripts. Failed script counter pegs increment when a trigger timeout occurs within a script.

User Defined Statistics detail user defined peg counts inserted into a script (to track specific events during a test, for example).

Receive and Transmit Peg Counts detail the total number of all message types transmitted and received.

Origination and Termination Statistics detail the total number of message types transmitted and received from origination scripts and the total number of message types transmitted and received from termination scripts.

Stopwatch Statistics detail User-Defined stopwatch counters inserted into a script (to track the time elapsed between specific events during a test, for example).

In addition to the SIP Traffic Generator statistics, the Statistics application of Spectra2 MG provides comprehensive SIP statistics that can be displayed in a variety of graphical formats, such as bar graphs and pie charts. Once configured to match the System Configuration, the Statistics application will track the results of SIP Traffic Generator testing scenarios, providing detailed statistics that can be exported to a database for itemized report creation.

The following is a sample listing of the SIP statistics tracked by the Statistics application:

- Total SIP PDUs
- Total SIP PDUs per IP Address/Port
- Total SIP Methods per Type
- Total Calls
- Total Active Calls
- Total Answered Calls
- Total Unanswered Calls
- Ratio of Failed to Total Calls
- Min., Max. and Average Setup Time
- Min., Max. and Average Conversation Time
- Min., Max. and Average Release Time

SIP Retransmissions

The SIP Traffic Generator provides support for automatic SIP retransmissions.

The Trigger Action (on the Scripting window) for each SIP trigger designated for retransmission within a generation script should be set to the "Retransmit" option; then if the trigger is not received, the last message before the trigger command in the script is retransmitted.
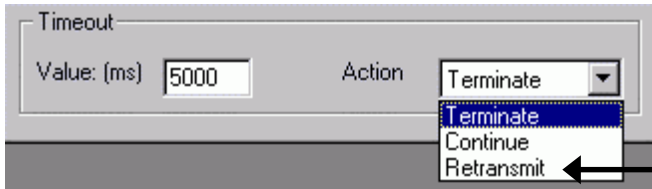
When the Timeout value expires during the execution of a script, the previous message is retransmitted and the Timeout value doubles. This process will continue, i.e., previous message is retransmitted and the Timeout value doubles, for up to 6 retransmission attempts. If after 6 retransmission attempts the Trigger times out again, the script will terminate.

Specification Compliance

The SIP Traffic Generator supports the specifications defined in RFC 2543, SIP: Session Initiation Protocol, March 1999.

The current IETF drafts based on SIP RFC 2543, March 1999 are under consideration for enhancements to the SIP Traffic Generator in future releases.

Though the IETF does not permit Inet or other vendors to claim compliance with any IETF draft specification, Inet believes in good faith that the Spectra2MG product would comply with draft-ietf-sip-rfc2543bis-05 if that specification were to be approved and published as a standard by the IETF in substantially its present form, with the exception of the following mandatory parameters:

- Mandatory Tags on TO: and FROM: fields

- Record Route and Route headers

Frequently Asked Questions

The following is a listing of some of the Frequently Asked Questions about the SIP Traffic Generator.

Q: Can ACK messages be sent directly to UAs (i.e., bypassing the Proxy Server)?
A: Since Spectra2 MG is emulating UAs in SIP traffic generation scenarios, this procedure would essentially send the ACK message from Spectra2 MG directly to Spectra2 MG. To simulate this scenario, remove the ACK from the test script.

Q: Can triggers be used at the beginning of Termination scripts?
A: No. This feature is planned for a future release of the SIP Traffic Generator.

Q: What is the difference between the Terminate Generation option and the Stop Gracefully option?
A: The Stop Gracefully option, when selected, ceases the generation of new calls – open calls will complete according to the script(s) running.
The Terminate Generation option, when selected, ceases generation immediately and immediately sends Cancel messages on all open calls.

Q: Can the Spectra2 MG Protocol Monitoring application be used to view SIP Traffic Generator results?
A: Yes. However, if the application is open while the SIP Traffic Generator is running, system performance, including calls per second, may be impacted.

Upcoming Features

The following is a listing of features planned for future releases of the SIP Traffic Generator.

- Testing of multiple Proxy Servers

- Media injection and detection

- TCP support

- UA Status statistics

- SIP Compact Headers

- Support for remote UAs

- Support for automatic UA registration/unregistration

- Support for a domain name or URL for the element under test