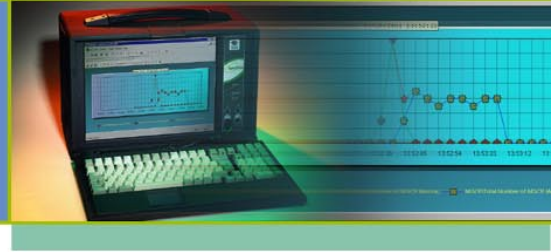# MGCP Traffic Generator v. 2.02

From Inet Technologies, Inc.

MGCP Traffic Generator

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

This application note outlines the functionality of the MGCP 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, MGCP registration procedures, and generation specifications.
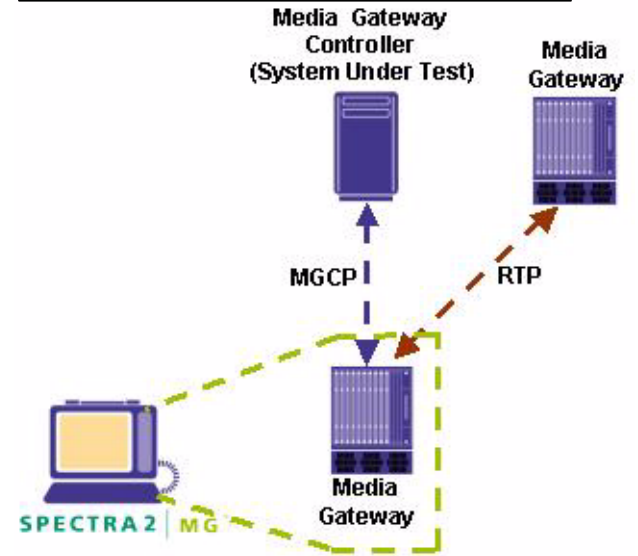
Testing Environment

The MGCP Traffic Generator tests **one Media Gateway (MG)** while emulating a Media Gateway Controller (MGC) *or* **one Media Gateway Controller** while emulating a Media Gateway.

The MGCP Traffic Generator version 2.02 supports RTP media injection only. Voice files, DTMF, and SF tones may be injected for the codecs supported by Spectra2 MG, including G.729A. G.723.1, and G.711.

MGCP Traffic Generator Testing an MG

When the MGCP Traffic Generator is emulating an MGC, an implied element (such as an adjacent MG) is also emulated to provide the source and destination of the associated media.
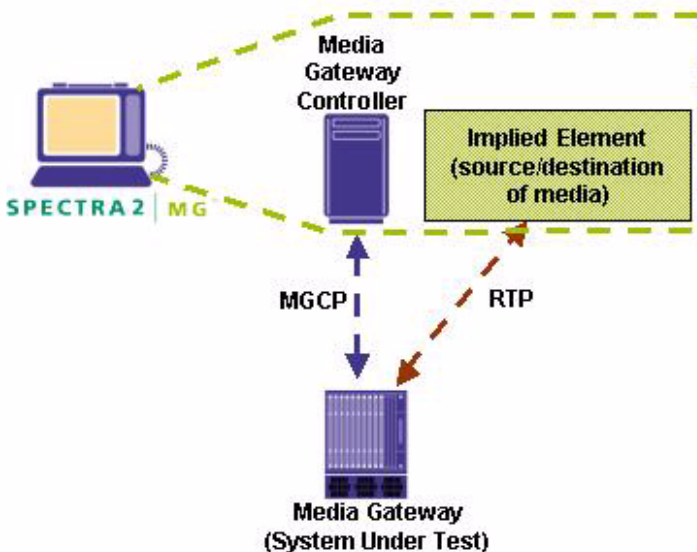
MGCP Traffic Generator Testing an MGC

An adjacent Media Gateway is only needed in the MGC testing scenario if RTP traffic is included.

The MGCP Traffic Generator does not test multiple MGs or MGCs.

Benchmarks

- Up to 100 calls per second (based on 9 signaling transactions per call)

- Up to 10,000 simultaneous calls

- Emulates 1 IP Address on MGCP Ports assigned to a Signaling and Trunk Interface, i.e., emulates only 1 element

- Up to 256 RTP Ports per Signaling and Trunk Interface (in version 2.02, these are used to populate SDP parameters as the destination of the associated media)

The injection of associated media will impact the Calls per Second benchmark listed above.

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 MGCP 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.

Pre-Configured Generation Scripts

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

- MG Origination
- MG Termination
- MGC Origination
- MGC Termination

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

Origination Script

Termination Script

MGCP Protocol Intelligence

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

Populated Parameters (Origination)

Transaction ID	Populated with system-generated value; increments with each outgoing command
Call ID	Populated with system-generated value
Connection ID	Populated with system-generated value
Endpoint Identifier	Populated from User-Defined Endpoint Parameters
Request Identifier	Populated with system-generated value; increments with each Notification Request
SDP	Populated from User-Defined RTP Ports Parameters

Wrapped Parameters (Termination)

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

- **Transaction ID**
- **Call ID**
- **Connection ID**
- **Endpoint Identifier**
- **Request Identifier**

The **SDP** Parameters are used to determine the destination of media. The MGCP Traffic Generator uses the IP Address and RTP Port obtained from SDP parameters in received command types and responses (i.e., CRCX, MDCX, 200OK) to determine the destination of injected media. The RTP Ports Parameters allow the user to define the destination of media sent from the System Under Test.

If a **Notified Entity** parameter is present in a Protocol Data Unit (PDU), the MGCP Traffic Generator will populate it with the IP Address of the emulated MG (Spectra2 MG).

If a NTFY message contains an **Observed Events** parameter, the MGCP Traffic Generator will populate it from the User-Defined Dialed Digits database.

The MGCP Traffic Generator does not populate the **Connection Statistics** parameter in a 250 response to a DLCX message. This parameter will transmit statistics as defined in the PDU.

Traffic Model Configuration

The MGCP Traffic Generator provides an intuitive interface for configuring Traffic Model parameters for specific testing scenarios.
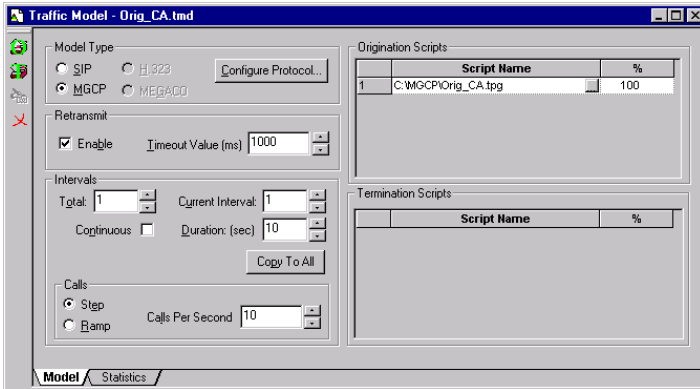
The **Model Type** field allows the user to select the protocol used for generation scenarios. The **Configure Protocol** button accesses a set of User-Definable Traffic Model Parameters specific to the protocol selected. For MGCP, this includes the System Under Test, MGCP Ports, RTP Ports, Dialed Digits, Auto Reply PDUs, and Endpoint parameters. The MGCP Traffic Model Parameters are detailed following this section.

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.
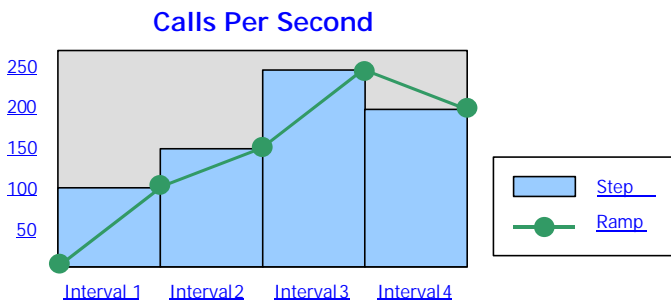
The **Origination and Termination Scripts** fields allow the user to assign up to 10 originating and 10 terminating scripts to each traffic interval. The **Load Percentage (%)** column allows the user to assign the probability of a script's use within the interval. For example, an Origination Script set to a 100% Load Percentage value in the first interval would be the only script used by the MGCP Traffic Generator in that interval.

MGCP Traffic Model Parameters

The MGCP Traffic Generator provides the following MGCP Traffic Model Parameters for MGCP generation scenarios.

The **MGCP Ports** parameters display the IP Address, Port Name, and Port Number of MGCP Ports configured in Spectra2 MG's System Configuration application. The user can define which IP Address and Port the MGCP Traffic Generator will use in the generation scenario.

The **RTP Ports** parameters allow the user to define how the SDP parameters will be populated, effectively determining the destination of the media sent from the System Under Test.

The **Dialed Digits** parameters are only used when Spectra2 MG is emulating an MG (i.e., the System Under Test is an MGC). The Dialed Digits simulate users dialing "through" an MG, i.e., phones. The Dialed Digits database is used to populate the Observed Event parameter of NTFY messages if they are present in the generation script.

The **Auto Reply PDUs** parameters allow the user to enable and define the PDUs used to automatically respond to messages received outside of the generation script or call model. By configuring the Auto Reply PDUs parameters, User-Defined PDUs can be sent in response to received messages.

The **Endpoints** parameters allow the user to define names for the physical Endpoints on the emulated MG or the MG Under Test. Endpoints are designated in a hierarchal naming structure consisting of one or more terms combined with a domain name.

MGCP Registration

When Spectra2 MG is configured to emulate an MG (i.e., an MGC is the System Under Test), the first traffic interval typically contains only one call which is used to send an RSIP message containing a wildcard with a restart method, e.g., RSIP 100 *@inet.com to the MGC Under Test. The MGC Under Test will respond to the RSIP by sending numerous RQNT (off hook) and AUEP messages to the defined Endpoints on Spectra2 MG. The MGCP Traffic Generator handles these messages by configuring the Auto Reply PDUs parameters – the messages are not included in generation scripts or call models.

If the MGCP Traffic Generator were to start the next traffic interval before processing the RQNT and AUEP messages sent by the MGC Under Test, all of the calls will eventually time out, due to the fact that the MGC Under Test will not send messages expected in the generation script if the AUEP and RQNT messages are not responded to in proper fashion.

In order to complete MGCP registration in this scenario, an "empty" traffic interval is inserted to allow Spectra2 MG the necessary time to process the global messages prior to proceeding with the generation of calls. The "empty" (processing) interval is created by completing the following steps:
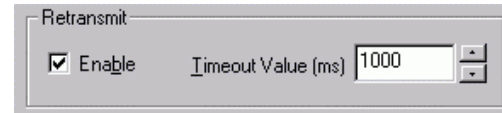
- Create and empty script with no messages and add it as an Originating Script in the Traffic Model window

- Set the Load Percentage of this script to 100%

- Set the Duration of the traffic interval to a value suitable for processing the initial global messages

The main MGCP call generation traffic interval is then set following this "empty" (processing) interval. This results in a total of three traffic intervals for the generation scenario, configured as follows:
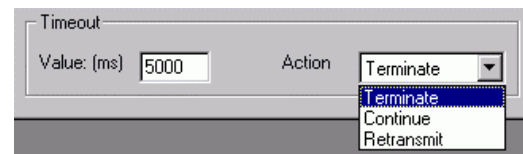
- **First Interval (send RSIP)**
  Calls per Second: 1
  Duration: 1 second

- **Second Interval (Processing)**
  Calls per Second: 1 (N/A)
  Duration: 3 seconds or greater

- **Third Interval (MGCP Call Generation)**
  Calls per Second: User-Defined
  Duration: User-Defined

MGCP Retransmissions

The Retransmit field on the main Traffic Model window contains an Enable checkbox that is used to turn MGCP retransmissions on or off for all triggers in MGCP generation scripts.

The Trigger Action (on the Scripting window) for each MGCP trigger designated for retransmission within a generation script should be set to the "Terminate" option; then if the trigger is not received, the last message in the script before the trigger command is retransmitted (if the Retransmit option is set to on in the Traffic Model window). If the Retransmit option is set to off, the last message is not retransmitted, and the script fails.

It is recommended that the Trigger Timeout values for MGCP triggers assigned a Trigger Action of "Terminate" be set to a value that will allow for at least two retransmissions. To determine the value to use, take the Retransmit Timeout value on the Traffic Model window and multiply it by 3.
(Note that the Trigger Action of "Retransmit" is not used for retransmissions in MGCP Traffic Generator scripts).

For example, using the default Retransmit Timeout value of 1000 ms, the first Retransmit will occur after 1000 ms. This value will then be doubled, and the next Retransmit will occur after 2000 ms. Therefore, in this example, it is recommended to use a Trigger Timeout value of at least 3000 ms. The Trigger Timeout values can also be increased beyond the recommended values as necessary.

It is also recommended that a value no smaller than 500 ms be used for the Retransmit Timeout value or Trigger Timeout values. This will assist in reducing the number of failed calls, especially at very high call rates.

Statistics

The MGCP Traffic Generator provides the statistics listed below for MGCP 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 MGCP Traffic Generator statistics, the Statistics application of Spectra2 MG provides comprehensive MGCP 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 MGCP 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 MGCP statistics tracked by the Statistics application:

- Total MGCP PDUs
- Total MGCP PDUs per IP Address/Port
- Total MGCP Messages 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

Specification Compliance

The MGCP Traffic Generator supports the specifications defined in the following documents:

- RFC 2705, MGCP: Media Gateway Control Protocol, October 1999
- RFC 2327, SDP: Session Description Protocol, April 1998
- RFC 1889, RTP: A Transport Protocol for Real-Time Applications, January 1996

The current IETF drafts based on MGCP RFC 2705, October 1999 are under consideration for enhancements to the MGCP Traffic Generator in future releases.

Frequently Asked Questions

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

Q: Is RTP media detection supported?
A: No, in version 2.02, media detection is not supported. However, since the Port range for MGCP media injection is known (as defined in the System Configuration application), the Media Tester application can be opened and configured to detect media on the Port range. The media will be detected but not correlated to the calls generated by the MGCP Traffic Generator.

Q: How are Endpoint Identifiers that contain wildcards handled by the MGCP Traffic Generator?
A: When the MGCP Traffic Generator is configured to emulate an MG (an MGC is the System Under Test), if a message containing an Endpoint Identifier with a wildcard is received, the MGCP Traffic Generator will select an Endpoint from the Endpoint database (configured in the Endpoint parameters) that matches the wildcard.
In MGCP, the following wildcards are used in combination with other Endpoint parameters: * designates All (Endpoints), $ designates Any (Endpoint).

Q: What is the difference between the Terminate Generation option and the Stop Gracefully option?
A: The Terminate Generation option, when selected, ceases all call generation.
The Stop Gracefully option, when selected, ceases generation immediately and immediately sends DLCX messages on all open calls.

Q: Can the Spectra2 MG Protocol Monitoring application be used to view MGCP Traffic Generator results?
A: Yes. However, if the application is open while the MGCP 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 MGCP Traffic Generator.

- Testing of multiple MGs and MGCs

- Media detection

- TDM support

- PSQM support

- Packet Cable support (TGCP/NCS)

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