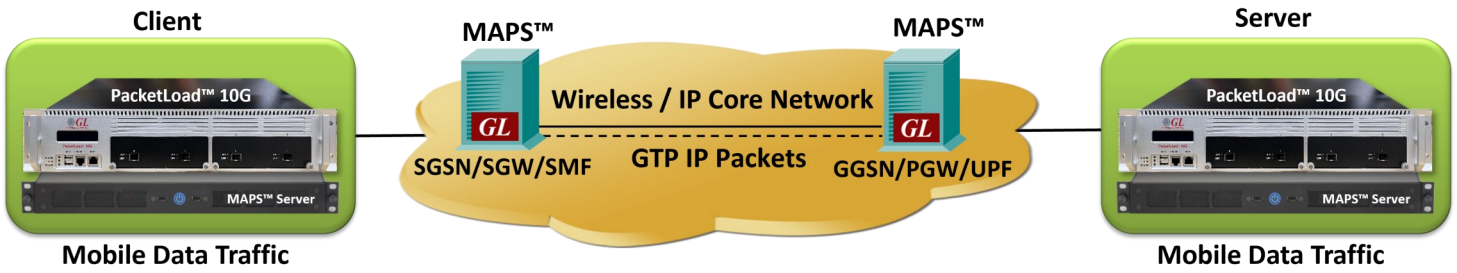
High Density Mobile Traffic Generation – PacketLoad™



Overview

GL's PacketLoad™ emulates up to 100,000 user endpoints with a high volume of mobile GTP-C (control plane), GTP-U (user plane) and packet traffic up to 40 Gbps to load test core UMTS/LTE networks. Users can encapsulate packet data within GTP headers and transmit through the gateway points such as Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN), and Mobility Management Entity (MME) or Serving Gateway (SGW) and Packet Data Network Gateway (PGW) or Next Generation Node B (gNodeB) and User Plane Function (UPF).

PacketLoad™ allows simultaneous simulation of multiple sessions per user to verify bearer allocation bandwidth at the end points. The solution offers stateful TCP/HTTP and UDP and PCAP Replay traffic types. PacketLoad™ supports HTTP traffic simulation with the base requirements such as port number, server IP address, and pre-canned HTTP traffic files.

The appliance works with GL's Message Automation and Protocol Simulation (MAPS™) software including 5G N1N2, 5G N4, LTE S1, LTE eGTP, UMTS Gn Gp, IuPS applications. The 1U MAPS™ Server controls PacketLoad™ using a command line interface. At the generating end, MAPS™ automates the process of creating UEs with different mobile traffic parameters. At the receiving end, MAPS™ with PacketLoad™ verifies the received data and provides various statistics including total packets transmitted and received, latency, bandwidth, total TCP connections created, successful connections, packet loss, etc.

For detailed information on PacketLoad™, refer to PacketLoad™ - High Density Mobile Traffic Generation (Up to 40 Gbps) webpage.

PacketLoad™ is available in following platform variants:-

PacketLoad™ 4 x 1Gbps (PKS172) - Data Traffic Generator 1U rack appliance with 4 x 1Gbps NIC interfaces: total capacity of up to 4 Gbits/sec Stateful TCP/HTTP Traffic.

Figure: MAPS™ Server with PacketLoad™ 1G Appliance

PacketLoad™ 4 x 10Gbps (PKS174) - Data Traffic Generator 2U rack appliance with 4 x 10Gbps NIC interfaces: total capacity of up to 40 Gbits/sec Stateful TCP/HTTP Traffic.

Figure: MAPS™ Server with PacketLoad™ 10G Appliance

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Key Features

- Generate multiple simultaneous mobile traffic streams to simulate real-world network conditions
- User-friendly interface for easy configuration and monitoring
- Generate traffic for various protocols such as 5G, 4G LTE, and 3G, ensuring compatibility with a wide range of networks
- Create and modify traffic profiles dynamically, adjusting parameters such as bandwidth, latency, and packet loss to simulate different network scenarios
- Scripting and automation for creating custom test scenarios and automating repetitive tasks, enhancing efficiency
- Features for managing multiple calls and sessions simultaneously, allowing users to simulate a variety of communication scenarios
- Provide real-time reporting and logging of test results, allowing users to monitor to analyze the network performance during testing

PacketLoad™ System Specifications

	PacketLoad™ 1G	PacketLoad™ 10G
		
Hardware Specifications	1U Rack Mountable 4 x 10M/100M/1GigE Electrical or 4 x 1GigE Fiber 2 x 10M/100M/1GigE Electrical Management 1 Console 2 x USB 2.0 100-240VAC 100W power w/switch 0°C – 40°C Operating Temperature	2U Rack Mountable 4 x 10M/100M/1G/10GigE Electrical or 4 x 10 GigE Fiber 1 x 10M/100M/1GigE Electrical Management 1 Console 2 x USB 2.0 100-240VAC 100W power w/switch 0°C – 40°C Operating Temperature
Wire-Speed Traffic Types	Bidirectional 4 Gbit / sec HTTP/TCP PCAP Replay	Bidirectional 40 Gbit / sec HTTP/TCP PCAP Replay
TCP/HTTP Stateful Traffic Generation	445K Transactions/sec 20M+ Concurrent TCP flows Zero-transaction size support Variable POST vs. GET Ratio	2M+ TCP/HTTP Transactions/sec 100M+ Concurrent TCP flows Zero-transaction size support Variable POST vs. GET Ratio
HTTP Payload Control	Custom Payload Files Generated Patterns	Custom Payload Files Generated Patterns
Mobile Infrastructure Testing	Dynamically add/stop/delete 60,000 subscribers simulation (per appliance) User Bandwidth Allocation	Dynamically add/stop/delete 10K+ User Adds and Deletes per sec Up to 1,00,000 maximum subscribers GTP-U Encapsulation (User Bandwidth Allocation
PCAP Replay	Split PCAPs to emulate “stateful” traffic Timestamp with scaling or wirespeed	Split PCAPs to emulate “stateful” traffic Timestamp with scaling or wirespeed

PacketLoad™ System Specifications (Contd.)

	PacketLoad™ 1G	PacketLoad™ 10G
UDP	Single Size Packets or Multi-Sized Packet Streams UDP IP Fragmentation Testing Controlled UDP Fragment Drop Testing	Single Size Packets or Multi-Sized Packet Streams UDP IP Fragmentation Testing Controlled UDP Fragment Drop Testing
System Interface	Web GUI REST API CLI	Web GUI REST API CLI
Analysis and Reporting	Full HTTP/PCAP/UDP/URL/User Statistics Total packets transmitted and received, Latency, Delay, Bandwidth, No of TCP connection created, Successful connection, Packet loss, etc. PCAP capture on all ports to identify setup issues	Full HTTP/PCAP/UDP/URL/User Statistics Total packets transmitted and received, Latency, Delay, Bandwidth, No of TCP connection created, Successful connection, Packet loss, etc. PCAP capture on all ports to identify setup issues
Firewall/ Content Control Testing	URL Filtering - 50M+ URL List Capacity Test DUT's HTTP Response for malicious URLs "allow/ block/redirect/accept/custom" Action Firewall Filtering Performance	URL Filtering - 50M+ URL List Capacity Test DUT's HTTP Response for malicious URLs "allow/block/redirect/accept/custom" Action Firewall Filtering Performance
Graphic Run-time Test Reporting	TX and RX Mbits - Each Port Active Connections Total TX and RX Thru-put Total TX and RX Good-put	TX and RX Mbits - Each Port Active Connections Total TX and RX Thru-put Total TX and RX Good-put
PCAP capture on all ports	RX, TX, Error "Wireshark"-ready	RX, TX, Error "Wireshark"-ready
Flexible Configuration Options	Basic Server/Client (op. VLAN) Virtual Router Server/Client (op. VLAN) Client-only / Server-only Proxy NAT Ping Response ARP support	Basic Server/Client (op. VLAN) Virtual Router Server/Client (op. VLAN) Client-only / Server-only Proxy NAT Ping Response ARP support

Applications on 5G Networks

End to End Testing

MAPS™ configured as gNodeB emulates GTP traffic in LTE network. MAPS™ gNodeB emulator allows to emulate massive number of UEs (more than 100,000) with the packet data traffic encapsulated within GTP headers. The generated packet data is transmitted through the UPF gateway point. At the receiving end, MAPS™ Server with PacketLoad™ is used to verify the received data with the various statistics such as Total packets transmitted and received, Latency, Delay, Bandwidth per port, Total TCP connections created, Successful connections, Packet loss, etc.

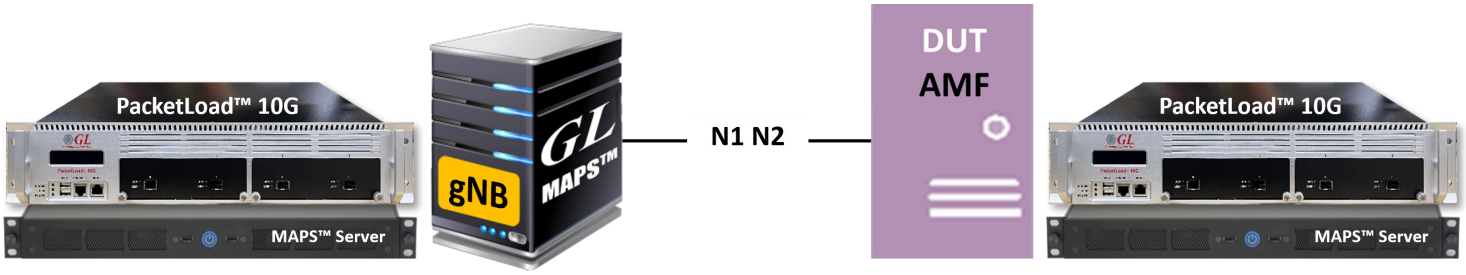

Figure: PacketLoad™ in 5G Network with End to End Testing

Single Interface Testing

Emulated GNode + AMF (MAPS™ 5G N1N2), UPF (MAPS™ 5G N4) along with the PacketLoad™ appliance can function together to test customer's AMF/UPF, gNB/SMF operation at full load under various traffic conditions, and thus perform comprehensive load testing.

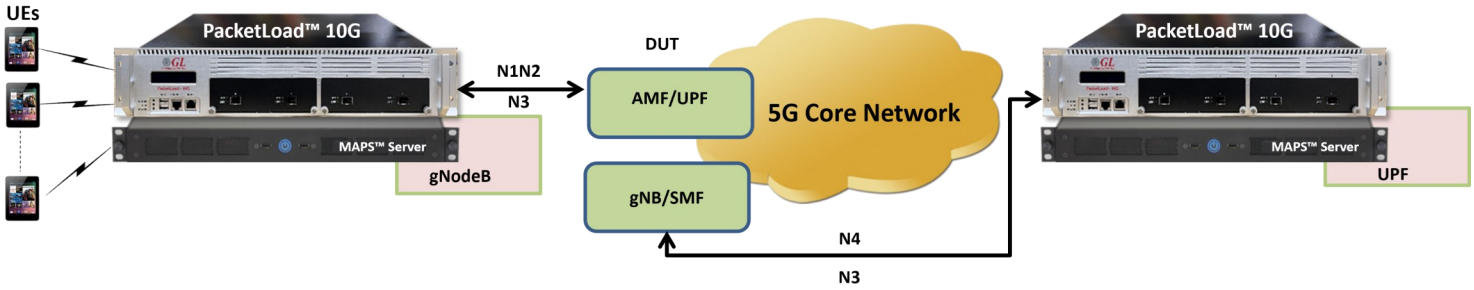

Figure: PacketLoad™ in 5G Network with Single Interface Testing

Applications on 4G Networks

End to End Testing

MAPS™ configured as eNodeB emulates GTP traffic in LTE network. MAPS™ eNodeB simulator allows to emulate massive number of UEs (more than 100,000) with the packet data traffic encapsulated within GTP headers. The generated packet data is transmitted through the SGW & PGW gateway points. At the receiving end, MAPS™ Server with PacketLoad™ is used to verify the received data with the various statistics such as Total packets transmitted and received, Latency, Delay, Bandwidth per port, Total TCP connections created, Successful connections, Packet loss, etc.

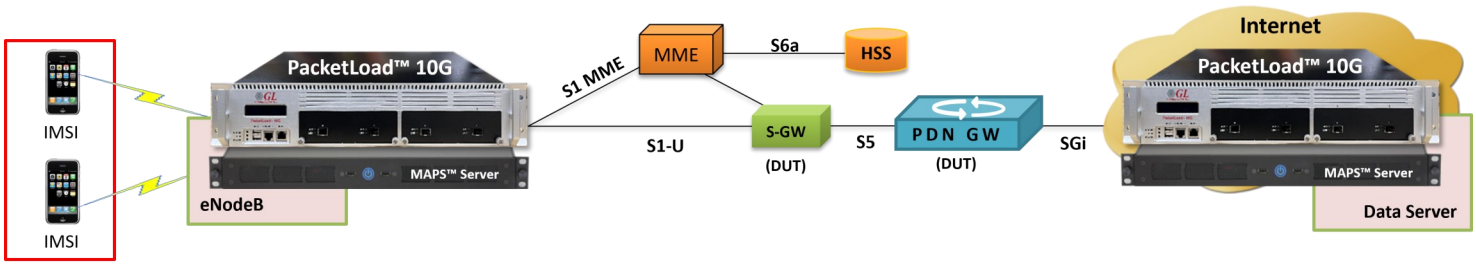

Figure: PacketLoad™ in 4G LTE Network with End to End Testing

Single Interface Testing

Emulated eNode +MME (MAPS™ LTE S1), PGW (MAPS™ LTE eGTP) along with the PacketLoad™ appliance can function together to test customer's SGW operation at full load under various traffic conditions, and thus perform comprehensive load testing.

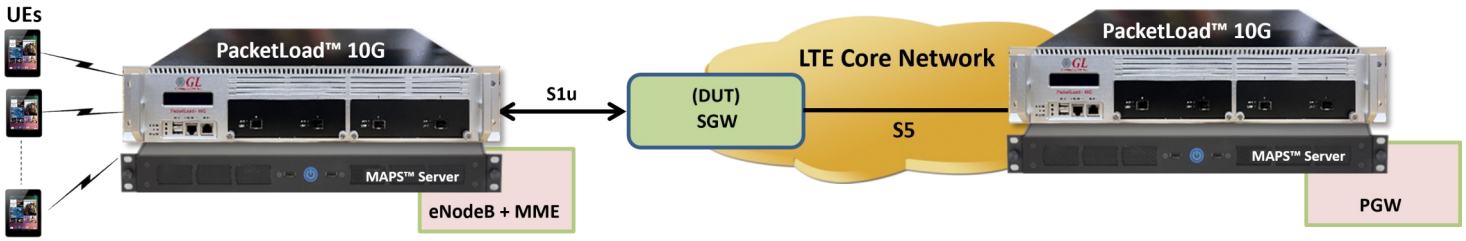

Figure: PacketLoad™ in 4G LTE Network with Single Interface Testing

Application on 3G Networks

End to End Testing

MAPS™ Server configured as RNC emulates GTP-U traffic with the help of PacketLoad™ and transmits through the SGSN & GGSN gateway points in UMTS network. The generated packet data is encapsulated within GTP headers. At the receiving end, MAPS™ Server with PacketLoad™ is used to verify the incoming packet data. The solution provides various statistics such as Total packets transmitted and received, Latency, Delay, Bandwidth per port, Total TCP connections created, Successful connections, Packet loss, etc. This helps to test UMTS network performance end to end at full load under various traffic conditions.

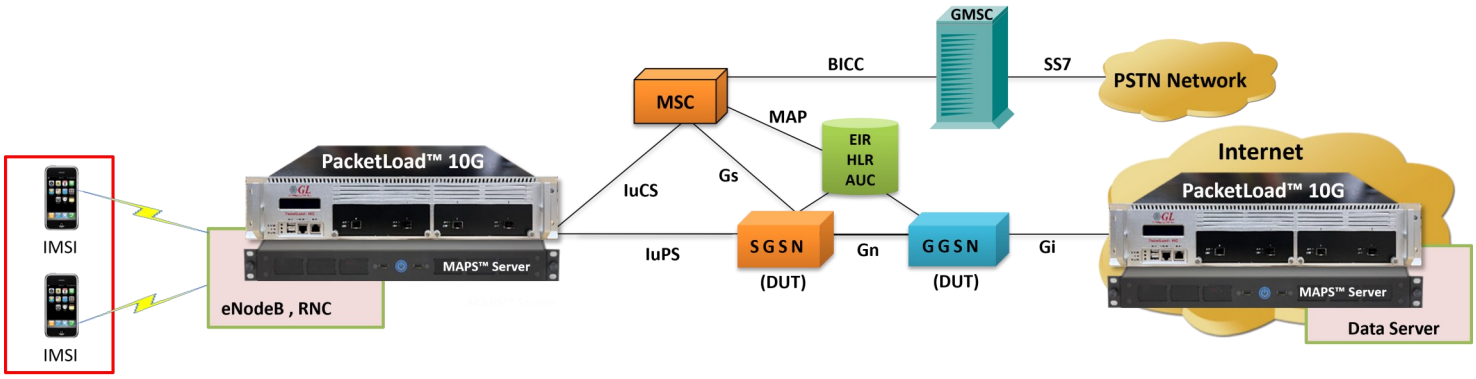

Figure: PacketLoad™ in 3G Network with End to End Testing

Single Interface Testing

MAPS™ Server as RNC (MAPS™ UMTS IuPS), and GGSN (MAPS™ UMTS Gn Gp) along with PacketLoad™ appliance can function together to test customer's SGSN operation at full load under various traffic conditions, and thus perform comprehensive load testing.

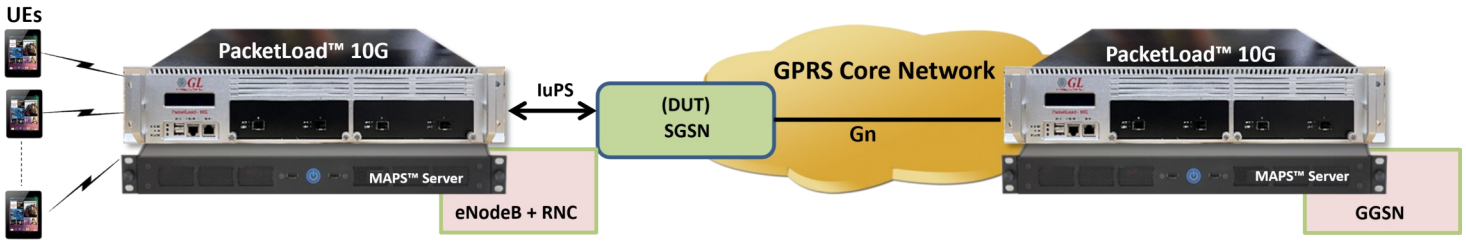

Figure: PacketLoad™ in 3G Network with Single Interface Testing

Modes of Operation

The application offers Transparent mode (with VLAN), Routed mode (with VLAN), Server-only, and Client-only modes of operating methods. When a DUT is operating transparently (example: L2 devices, IPS), "Transparent" (or "GTP to GTP Traffic") mode of operation is chosen. To work with devices such as routers and L3 switches, selected "Routed Mode" (or "GTP to IP Traffic") mode of operation is chosen.

Transparent Mode (GTP to GTP Traffic)

Transparent mode supports the user plane GTP packets through a DUT that is transparent to the network and passes the traffic without any IP translation.

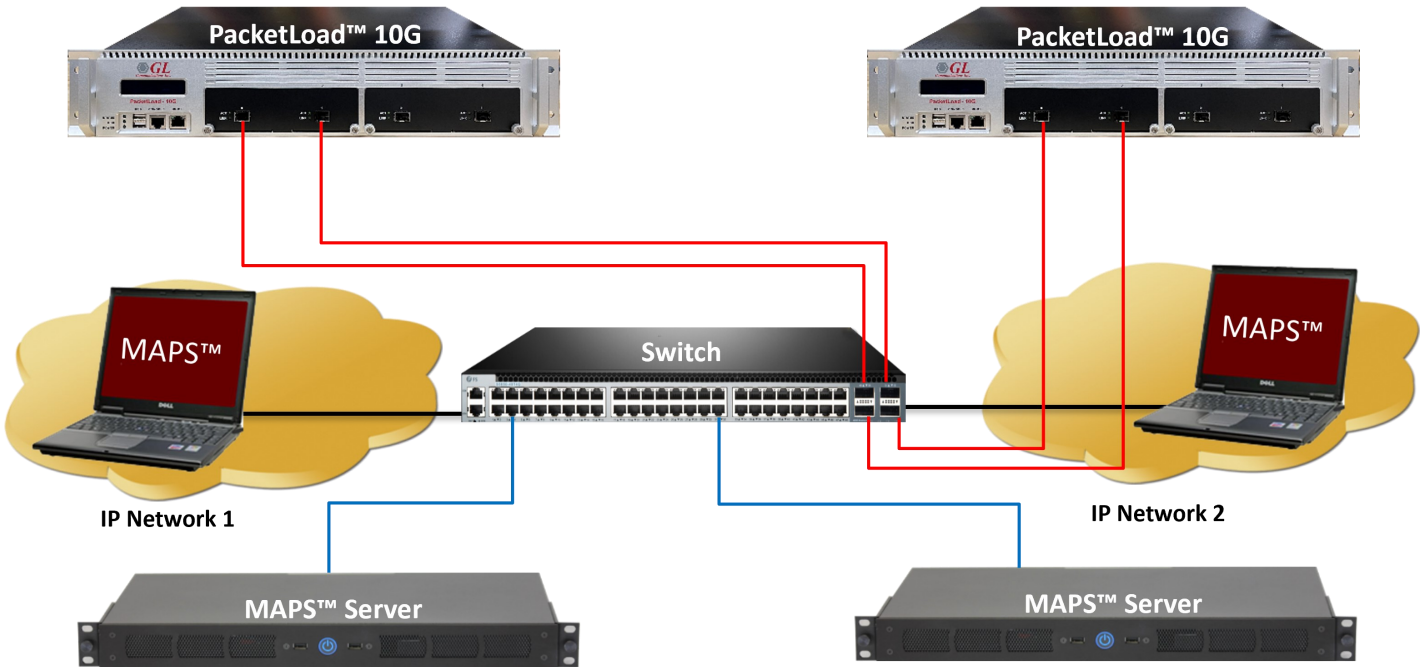

Figure: GTP to GTP (Transparent mode) Traffic Operation

Routed Mode (GTP to IP)

Routed Mode supports the packet transmission and reception services through a gateway, where the network packets from PacketLoad™ will pass through a Gateway and converts the traffic mode form GTP to IP, and sends the IP traffic for further analysis.

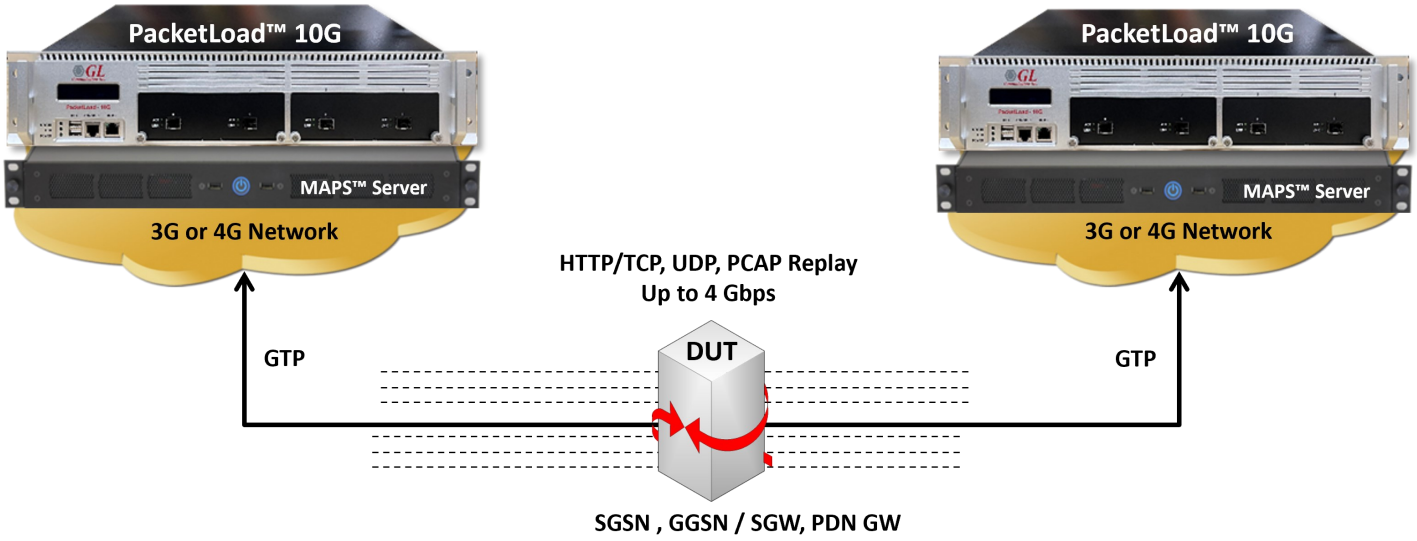

Figure: GTP to IP (Routed mode) Traffic Operation

Call Control and Mobile Data Traffic Statistics

The PacketLoad™ global parameters are defined in the call generation scripts, which are calculated and updated periodically providing real-time mobile data traffic metrics. Typically following statistics are generated from the application. Users can customize the statistics for the generated stateful TCP/HTTP, and PCAP Replay and other Mobile Data traffic.

- Link Level- Link state/speed, ARP
- Per Port - TX/RX rate/s, packets /sizes, Bytes
- Packet - Payload Size via MSS (1B to 9400B)
- TCP/IP– SYN, SYN_ACK, ACK, RST, HTTP_GET, HTTP_POST, TCP/IP Checksum Errors
- PCAP Replay - Packets Sent and Received
- UDP - Packets Sent and Received

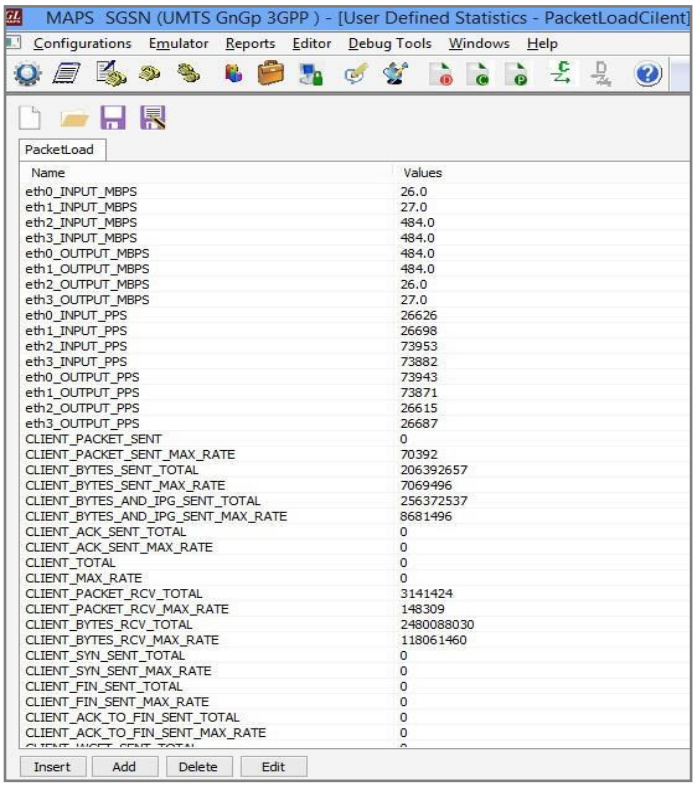

Figure: Mobile Data Traffic Statistics

Call Graph uses the results from statistics to plot graphically the Bandwidth on each port, HTTP_latency, TCP_Latency, and UE related statistics in form Bar/Line/Pie charts

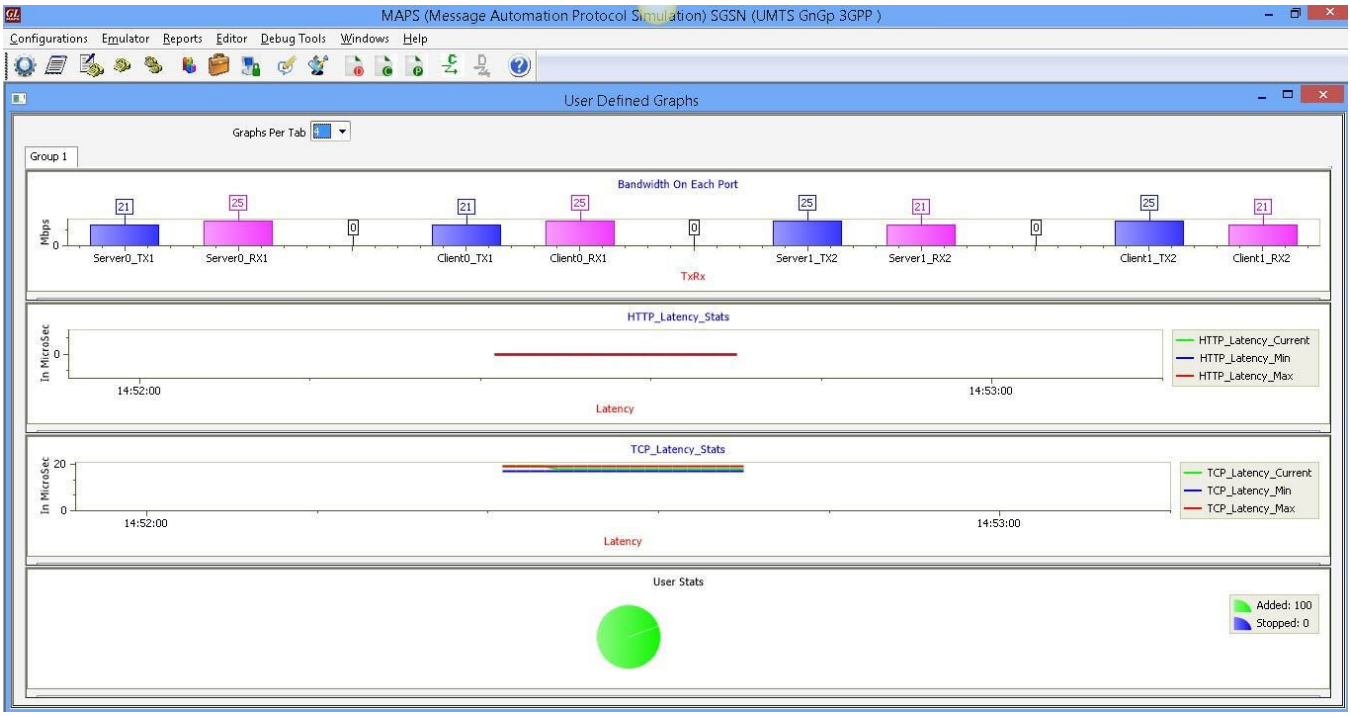

Figure: Mobile Traffic Call Graph

Buyer's Guide

Item No	Product Description
PKS172	MAPS™ Server with PacketLoad™ 1G
PKS174	MAPS™ Server with PacketLoad™ 10G

Item No	Related Software
ETH100	Packet Traffic Simulation - GTP
ETH101	Mobile Traffic Core-GTP
ETH102	Mobile Traffic Core-Gateway
ETH103	Mobile Traffic - Gb
PKS166	MAPS™ UMTS Gn Gp Emulator
PKS140	MAPS™ LTE S1 Emulator
PKS142	MAPS™ LTE eGTP (S3, S4, S5, S8, S10, S11 & S16) Emulator
PKS160	MAPS™ UMTS IuCS IP Emulator MAPS™ UMTS IuH IP Emulator
PKS131	MAPS™ Gb Emulator over IP for BSC & SGSN
PKS500	MAPS™ 5G N1N2 Interface Emulator
PKS501	MAPS™ 5G N4 Interface Emulator

For more details, refer to PacketLoad™ - High Density Mobile Traffic Generation (Up to 40 Gbps) webpage.

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