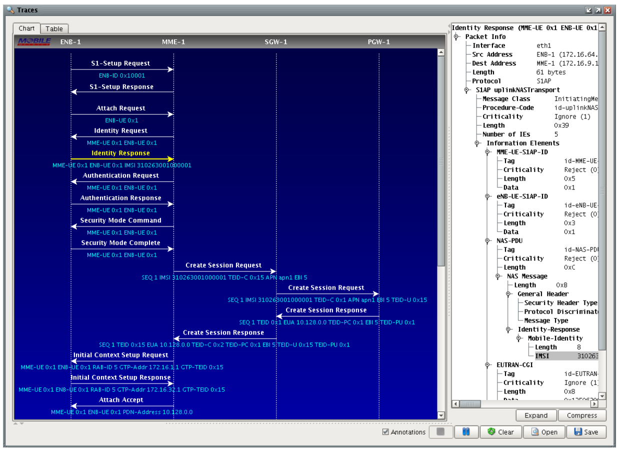
Torrent 6100 LTE Test System

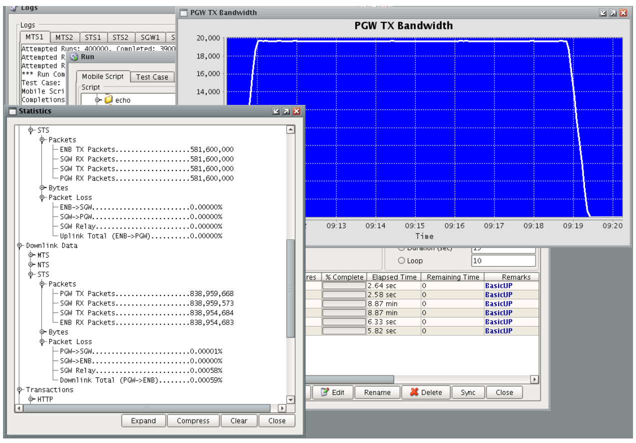
Product Data Sheet

The Torrent 6100 is a Linux based high performance linearly scalable test solution that is targeted for use in testing the 3GPP LTE enhanced packet core (EPC) network.

Packed with features from the award winning Torrent series, it adds numerous new ones of its own to bring you a state of the art test experience. Easily bring up a single session and trace it:

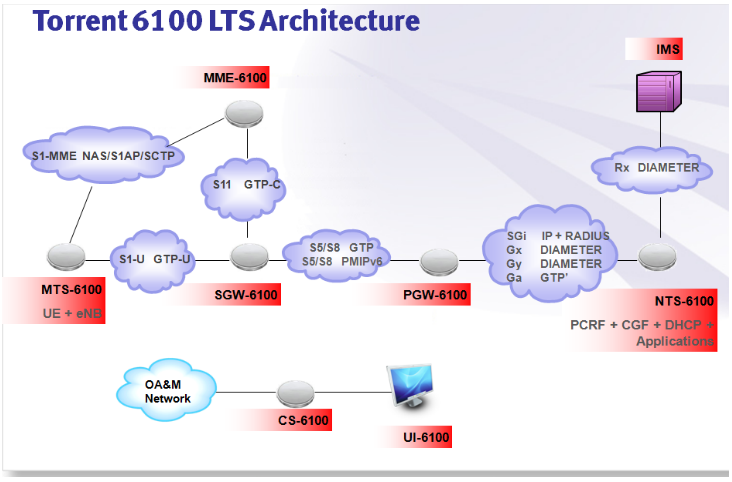


Or bring up millions of subscribers with tens of thousands of them streaming youtube data at 20Mbps each with the same ease:



Then scale that just by adding more servers.

Architecture Overview

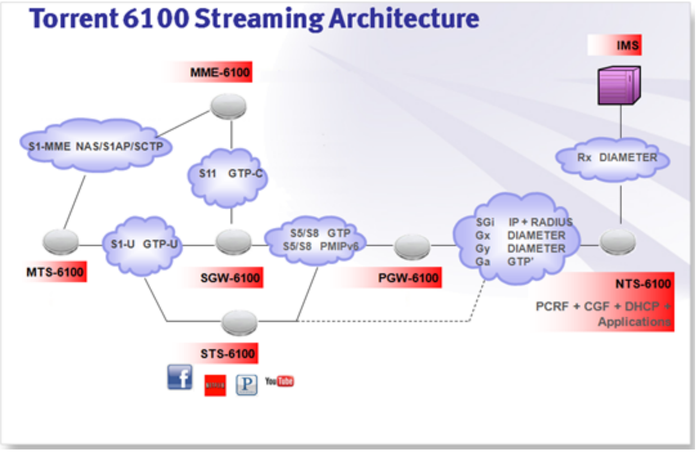


Torrent 6100 consists of several high performance server applications that together can emulate the LTE EPC or just parts of it. Furthermore, although it is not shown, the system can also emulate the 3G/UMTS packet core network (e.g SGSNs and GGSNs).

This central controller for the system, called the CS-6100, automatically configures, starts, and directs the traffic servers in the system to run tests as directed by the user through a GUI interface.

The MTS-6100 traffic server authentically simulates 1 to 5M+ UEs and thousands of enhanced NodeBs (eNBs) on a Linux machine. The MME-6100 simulates the Mobility Management Entity, or alternatively can be replaced with the MME under test. Similarly the SGW-6100 and PGW-6100 simulate the Serving Gateway and PDN Gateways respectively, and like the MME-6100 may be replaced with their counterparts under test as desired. Finally, the NTS-6100 provides a convenient aggregation of network servers (MMS, HTTP, FTP, SMTP, DHCP, PoC, WAP, etc.) as well as acting as a PCRF, CGF, and Radius Server.

Both the SGW-6100 and PGW-6100 can scale such that each one can act as 100 or 1000+ SGW or PGW instances.



The system also features support for high speed streaming of many different types of popular traffic types including YouTube, Netflix, Facebook, Pandora, and the like, and for doing so at very high rates and with very low packet loss even at those rates. As can be seen above, this is accomplished by the addition of a new Stream Traffic Server (STS) component to the system. This new element of the system works in lock step with the control plane to allow mobiles to stream these new traffic types with very high precision; that is, packet transmission rates, and interarrival times are very authentic compared to how such streams appear in the field (in those respects).

Standard Server Platform

The standard platform for the 6100 is 2U and supports 2-4 10GE links depending on requirements:

Single-Server Performance (LTE)

Below are characteristic performance figures for the case for the in which all nodes are emulated:

Parameter	Value	Units
Attach Rate	10,000	Attaches/sec
Detach Rate	60,000	Detaches/sec
S1 Handover Rate	15,000	Handovers/sec
X2 Handover Rate	30,000	Handovers/sec
Data Throughput	20	Gbps
Attached Subscribers	5M	Subscribers
ENBs	5000	Radios
SGWs	1000	Gateways
PGWs	1000	Gateways

Single-Server Performance (3G)

The 6100 system can also emulate 3G mobiles, SGSNs and GGSNs with the following performance figures as follows:

Parameter	Value	Units
Activation Rate	30,000	Activations/sec
Deactivation Rate	60,000	Deactivations/sec
IRAU Rate	40,000	Handovers/sec
Data Throughput	20	Gbps
Attached Subscribers	7M	Subscribers
SGSNs	5000	Gateways
GGSNs	1000	Gateways

Key System Features

The Torrent system has numerous features field proven features, some of which are listed below:

- Functional Testing
- Load Testing
- Full Automation
- Linear Scalability
- Graphs
- Histograms
- Detailed Hierarchical Statistics
- Combined 3G-UMTS and 4G-LTE testing

- Realistic Mobile Subscriber Emulation
- IPv4 and IPv6 Support
- High Bandwidth Streaming (YouTube, Netflix, Pandora, etc)
- MILENAGE Authentication
- Test/XOR Authentication
- AES Ciphering (128-EEA2)
- Null-Ciphering (128-EEA0)
- VLAN Tagging (IEEE 802.1Q)
- VoIP Support, including SIP, RTP, and RTCP
- 10 Gigabit Ethernet Support (LR/SR)
- Multiple Primary Contexts
- Multiple Secondary Contexts

Mobile Protocols Supported

Each mobile has its own protocol stack and supports the following protocols:

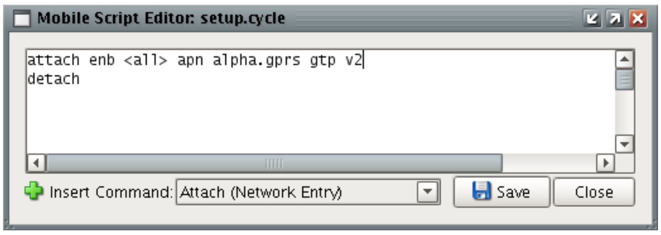
- IPv4
- IPv6
- TCP
- HTTP
- UDP
- FTP
- MMS
- SMTP
- POP3
- PTT
- SIP/RTP/RTCP
- ICMP
- DNS
- PPP
- SSL
- Streaming (Youtube, Netflix, Pandora)

3GPP Interfaces Supported

- S11 - The MME to SGW Control Interface
- S1-U - The ENB to SGW Data Interface
- S1AP/S1-MME - The ENB to MME Control Interface
- NAS – The UE to MME Interface
- S5 - The SGW to PGW Interface
- S8 - PLMN Variant of S5
- SGi - The PDN / Internet Interface
- Gx - The PGW to PCRF Interface
- Gn – For SGSN to GGSN Communication

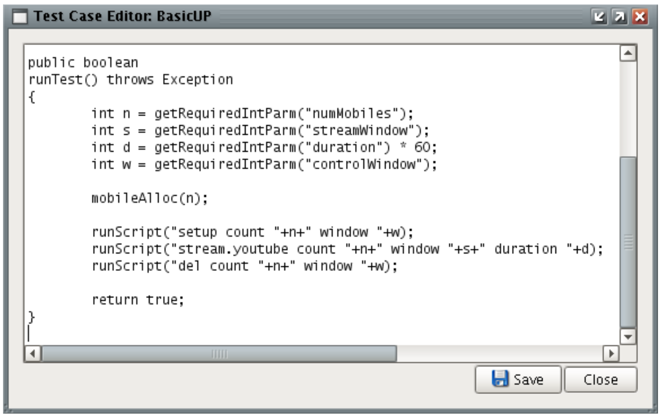
Scripted Mobile Behavior

Virtually everything mobiles do can be scripted down to the single-mobile level:



Java Based Test Cases

Typically, traffic is generated in the system through the use of automated, Java-based test cases which can invoke mobile scripts on arbitrary ranges of mobiles, and which can also run other test cases:



These tests may be run for short durations, or they may be run for days or even weeks to soak the system under test.

Test cases are associated with a pass/fail result, the criteria for which can be adjusted per your requirements:

Test Case	TC #	State
BasicUP (numMobiles=200000,controlWi...	1	PASSED

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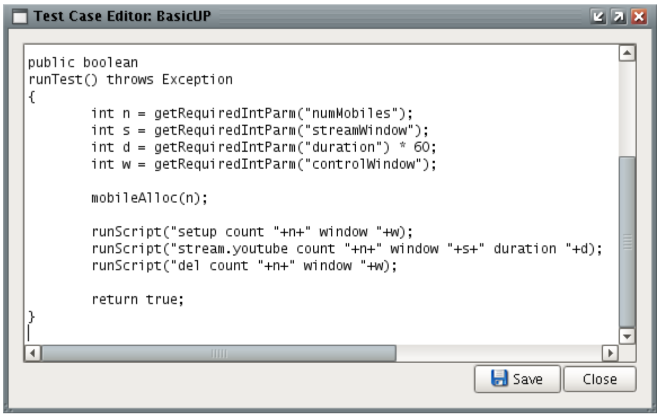

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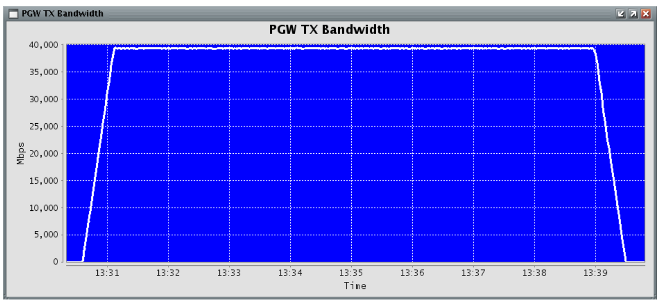
Real-Time Graphs

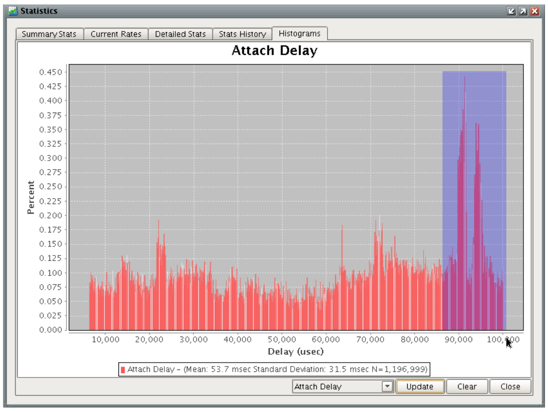
The system allows a wide variety of level and rate metrics to be graphed in real time:



Standard features such as zoom, pan, save, and print are available for all of them.

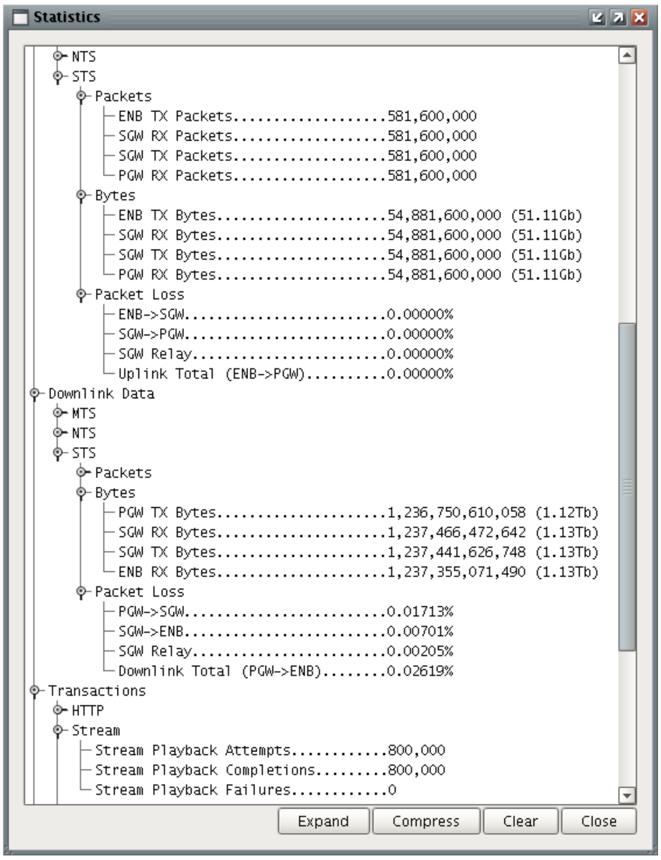
Histograms

Histograms are available as well, also with pan and zoom functions:

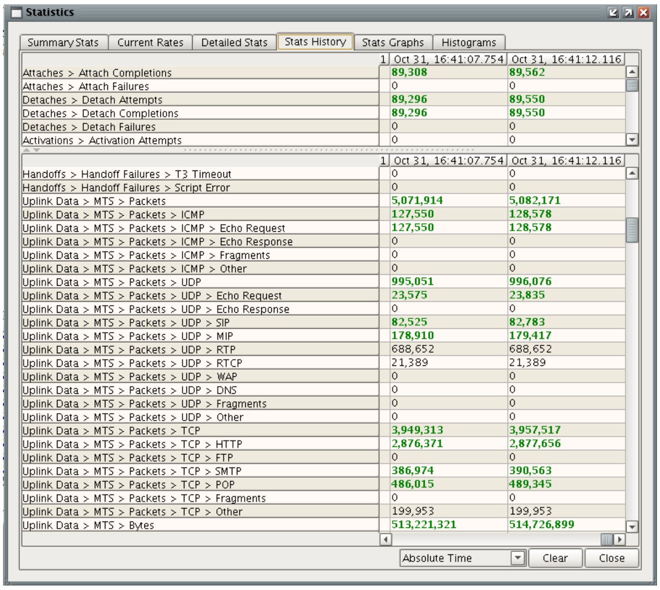


Detailed Statistics

The system tracks numerous statistics system wide and they're available to be viewed in tree form:

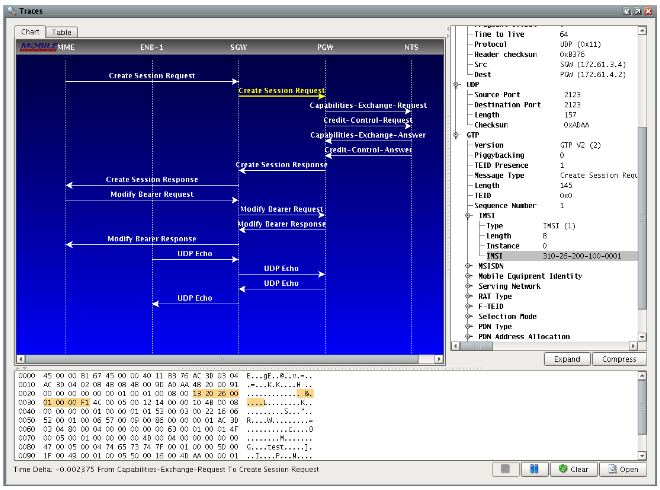


As well as spreadsheet form, the underlying information for which is also saved in CSV format for arbitrary post processing:



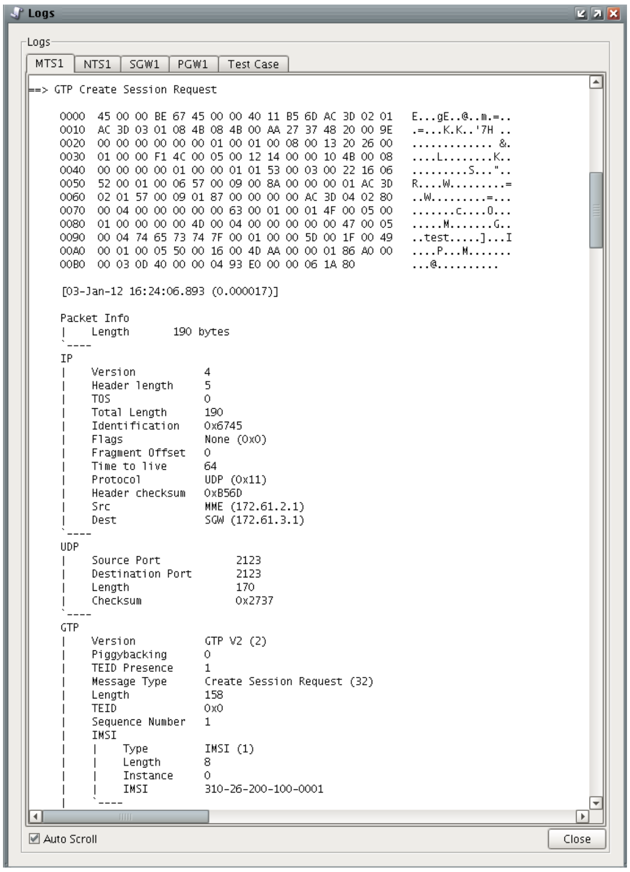
Graphical Tracing

As far as we know, the Torrent system was the first wireless test system to incorporate graphical tracing; allowing you to see “the big picture” with greater ease:



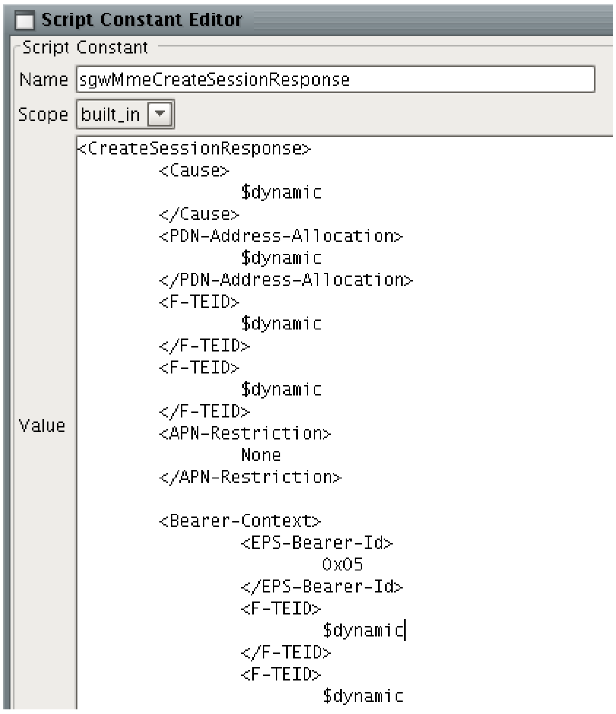
Text Based Tracing

In some cases it’s useful to have a text based representation of a captured message flow (e.g. for detailed study), which the system offers as well:



XML Configurable Messages

One of the biggest changes in the 6100 as compared to its predecessors in the Torrent series is an innovative XML Template Engine which allows you to specify the content of messages (an ordering of that content for that matter):



Fields may be hard coded, omitted, or re-arranged as desired. Certain ones, tagged as “$dynamic” are filled in intelligently in real time.

Specification Compliance

3GPP TS 29.060 – GTPv1
3GPP TS 29.274 – GTPv2
3GPP TS 29.281 – GTP-U
3GPP TS 29.273 – EPS AAA
3GPP TS 24.301 – NAS
3GPP TS 36.413 – S1AP
3GPP TS 29.212 – Policy and Charging over Gx
3GPP TS 32.299 – Diameter Charging / Telecom Mgmt
3GPP TS 32.296 – Online Charging System
3GPP TS 29.212 – SGW to PCRF Interface

RFC 791 – IPv4
RFC 2460 – IPv6
RFC 6733 – Diameter
RFC 5516 – Diameter 3GPP Codes
RFC 3261 - SIP
RFC 3550 –RTP
RFC 3605 – RTCP
RFC 2616 – HTTP 1.1
RFC 2960 – SCTP
RFC 1034 – DNS
RFC 1939 – POP3
RFC 2821 – SMTP

Note that the system complies with **Release 10** of the 3GPP specifications unless otherwise noted.

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