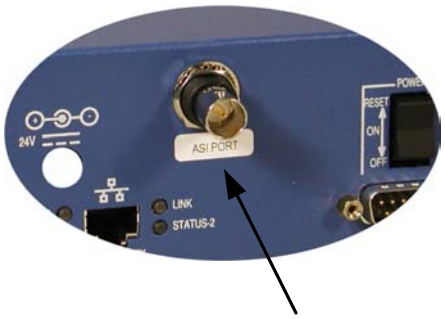
Singulus G1-T
10/100/1000 *with built-in TAP*

Network Traffic Stimulus, Capture and Analysis System for 10/100/1000 Ethernet



Built-in egress ASI port for Video over IP applications

Features

Network Traffic Generation

- Wire speed traffic generation up to 4MB of Ethernet packets
- Supports fiber optic 1 GbE and copper 10/100/1000
- Allows complete stimulus packet definition
- Traffic Shaping for creation of real-world load patterns
- Packet Injection allows user to asynchronously inject user packet

Network Monitoring and Capture

- Several counters for all network traffic including errors
- Packets are time stamped with 10ns resolution clock for inter packet timing analysis
- Capture up to 4MB of network traffic with protocol decode
- Integrated with the Tektronix LA for deep packet capture and triggering
- Bit level triggering and filtering on any packet type including error packets
- Supports multi-state and multi-clause triggering using state based trigger machine of TLA600 and TLA700 series Logic Analyzers
- Supports several export formats of captured network traffic, including FPGA/ASIC simulation file format

Product Overview

IneoQuest's Singulus G1-T™ provides line rate traffic stimulus and analysis for 10/100/1000 Ethernet compliant devices to the development engineer at a cost effective price. Singulus G1-T provides a set of new features specifically for design and development engineers.

In addition to standard traffic stimulus and analysis capabilities, including wire-speed traffic generation, capture, analysis, and performance verification, Singulus G1-T can be used to test transmission of MPEG2 Transport Streams over Gigabit Ethernet.

Singulus G1-T is also perfect for the embedded development lab. Singulus provides the engineer with a closed loop test tool that can excite and monitor all Ethernet traffic from a networked embedded device. The built in TAP allows the user to monitor traffic between two end points with out interruption and up to line rate.

Singulus G1-T is also scalable to help create the same closed loop test environment as the customers product moves into application development. Singulus supports several vertical applications on top of the Ethernet base, including video over IP.

Singulus G1-T has a built in egress ASI port to allow MPEG content for video over IP to be directed to other tools or MPEG decoders.

Singulus is portable and cost effective. The Singulus Platform allows the engineer to control the packets in and out of their system with an ease user interface.

Advanced Features

MPEG2 Traffic Generation

- Play MPEG2 files from a host machine through the Singulus
- Supports CBR and VBR MPEG2 files
- Provides detail control over IP packet jitter for testing
- Allows user to drop IP packets from stream on command
- Supports line rate foreground Ethernet traffic from Singulus Traffic engine

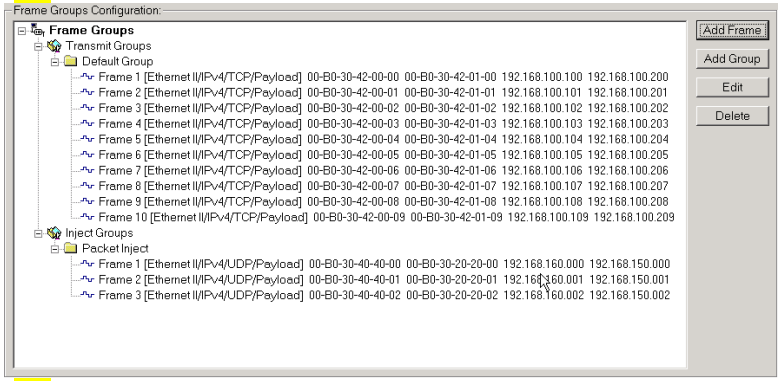
Other Features

- Tcl and C API support
- Seamless Integration to the Tektronix Logic Analyzer
- Seamless Integration to the Tektronix MPEG Analyzers
- IQ Fat Pipe for device driver and embedded system analysis

MPEG2 Traffic Analysis

- Filter Ethernet traffic carrying MPEG2 Transport Streams
- Built in egress ASI port to stream MPEG to MPEG analysis tools or decoders
- Perform jitter and inter-packet arrival time histograms for TS packets containing the selected video
- Singulus will filter a selected program from the incoming Transport Stream, at rates up to 40Mb/s, and stream this to a MPEG2 viewer on the host for visual inspection

Network Traffic Generation

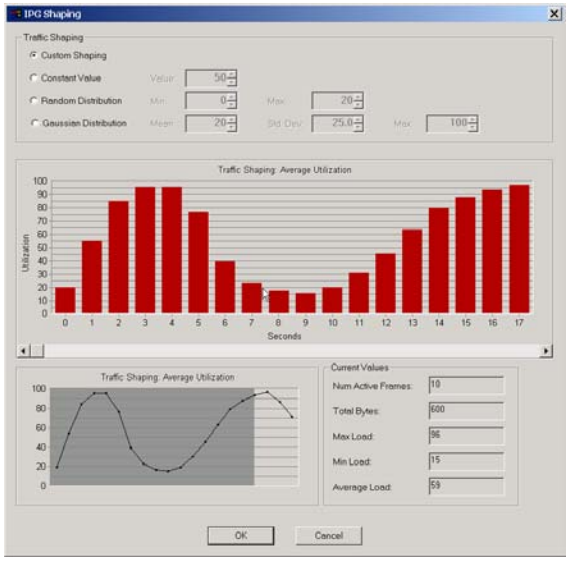


Traffic Creation and Generation

- Define up to 4MB of Ethernet packet to be streamed onto the test port
- Selectable packet rates up to line rate
- Create triggers and error packets
- Define every bit in the packet layers 2-7

Packet Injection

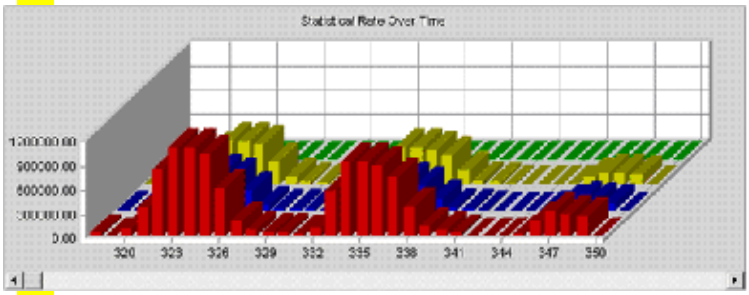
- Create asynchronous packet events in-band
- Send user created packets with a mouse click
- Packets can be sent in-band to the line rate foreground traffic

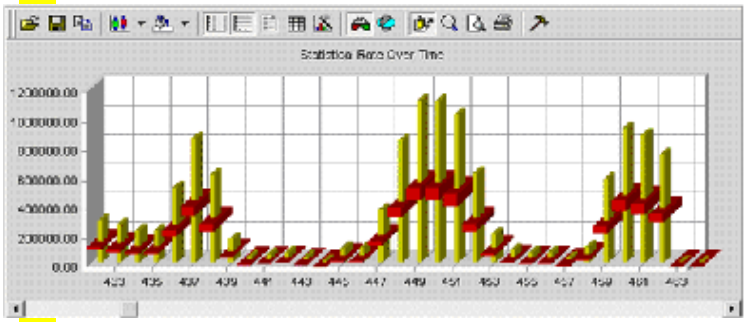


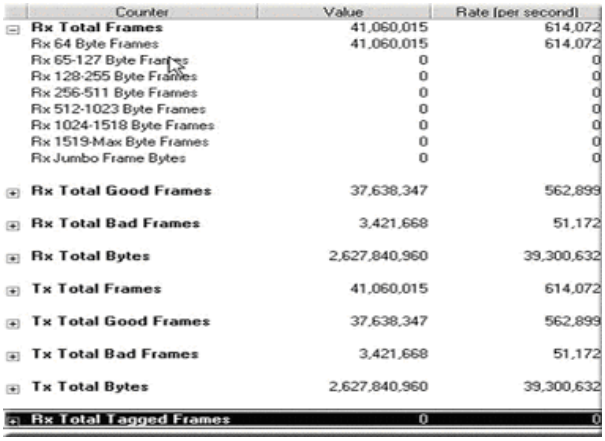
Traffic Shaping

- Create non-linear line loads with the user defined packets
- Create traffic shapes by drawing with the mouse input
- Define up to 512 seconds of traffic shaping
- Use custom or predefined shapes

Network Analysis, Capture and Protocol Decode



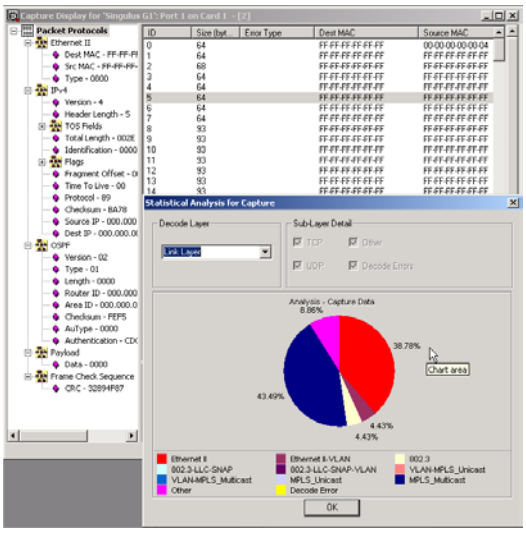




Counter	Value	Rate (per second)
Rx Total Frames	41,060,015	614,072
Rx 64 Byte Frames	41,060,015	614,072
Rx 65-127 Byte Frames	0	0
Rx 128-255 Byte Frames	0	0
Rx 256-511 Byte Frames	0	0
Rx 512-1023 Byte Frames	0	0
Rx 1024-1518 Byte Frames	0	0
Rx 1519-Max Byte Frames	0	0
Rx Jumbo Frame Bytes	0	0
Rx Total Good Frames	37,638,347	562,899
Rx Total Bad Frames	3,421,668	51,172
Rx Total Bytes	2,627,840,960	39,300,632
Tx Total Frames	41,060,015	614,072
Tx Total Good Frames	37,638,347	562,899
Tx Total Bad Frames	3,421,668	51,172
Tx Total Bytes	2,627,840,960	39,300,632
Rx Total Tagged Frames	0	0

Traffic Counters

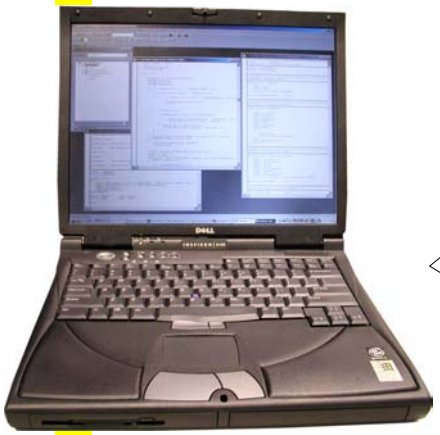
- Several counters including errors and total counts
- Counter record total packets received and transmitted
- Counter record packet rates per second for timing analysis



Traffic Capture, Analysis and Protocol Decode

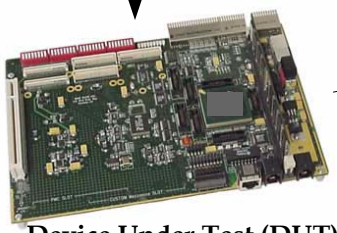
- Packets received are time stamped with 10ns resolution clock
- Post inspection of the time stamps can reveal Jitter and other analysis
- Ethernet packets can be exported to several formats including Libpcap, Excel, and FPGA/ASIC simulation file formats
- Singulus supports several protocols and decodes all captured traffic
- Packet analysis and protocol decode works the same with the Tektronix LA

Typical Embedded Application Test Setup



Control, monitoring and measurement from a PC over TCP/IP

Singulus Network Traffic Generation and Capture



Device Under Test (DUT)

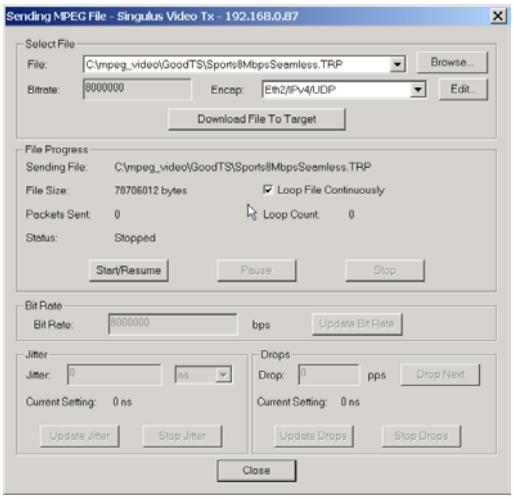
Tektronix Measurement of DUT

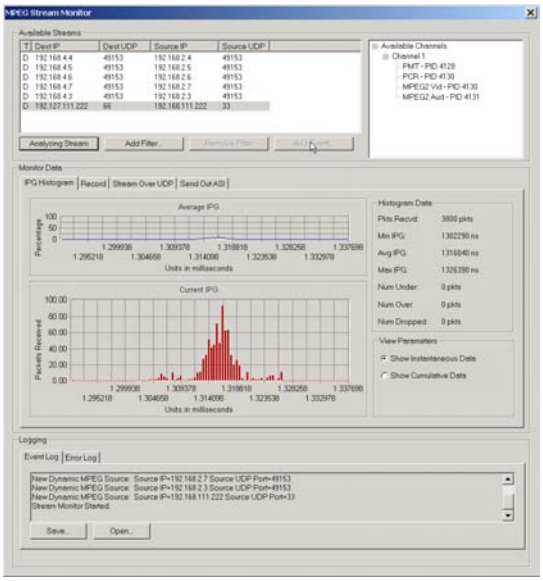
- Send known good packets to DUT while measuring hardware buses, firmware ISRs, driver code, or application testing
- Singulus can drive DUT to up to line rate exercising boundary conditions on buses, drivers and software
- Integrated tot he Tektronix LA, cross triggering between LA and Singulus and provide correlated data movement through DUT
- Exercise other units in DUT including DMA channel, internal buses, hidden integrated peripherals and multiprocessor communications by sending and receiving data through the "fast" Ethernet port

Advance Features - Video Over IP

MPEG2 Generation

- Define the packet header for the MPEG2 file that is to be sent out on the 10/100/1000 Ethernet channel
- Identify the file to be downloaded to Singulus (up to 80 MB)
- File can be looped continuously
- Singulus can re-stamp the PCR and CC bits in the MPEG Stream
- Define the jitter pattern to apply to the IP packet stream
- Pause, play and stop control over file streaming





MPEG2 Monitoring

- Filter Ethernet on source or destination UDP port or IP address
- Monitor will automatically find PAT and PMT tables and populate channels on networks
- Singulus will continue to count and track all Ethernet traffic for analysis
- Measure jitter, record jitter and video streams to hard drive, and play MPEG in Singulus GUI
- Singulus can output MPEG to built-in ASI port for other analysis or MPEG decode.

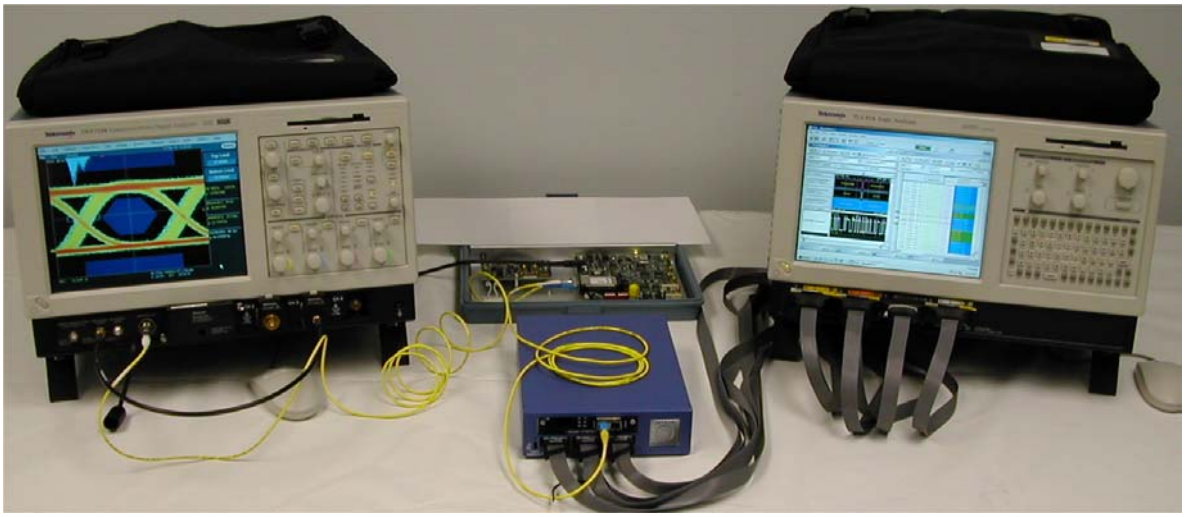
Tekronix MPEG2 Monitoring and Test Equipment

- ASI output of the Singulus G1-T feeds directly into the Tekronix MPEG tools
- Singulus G1-T filters and strips the Ethernet frame from the MPEG and feeds the data to the ASI port at line rate
- Singulus G1-T passes MPEG data as it arrives so accurate PCR jitter can be determined
- MTM400 from Tektronix
- MTS300 from Tektronix

Tekronix MTM400 MPEG Monitoring System

Tektronix MTS300 MPEG Test System

Singulus and Tektronix Tools



Singulus being used to excite DUT with Tektronix scope and Logic Analyzer measuring the results

Specifications

General

Network Stimulus and Protocol Analysis Platform with Integrated 10/100 Base TX LAN.
Copper
Optical Fiber (via industry standard SFPmodule)

Physical

Size	9.6 x 7.0 x 2.1 in	(24.4 x 17.8 x 5.3 cm)
Weight (empty)	2.4 lb	(1.09 kg)
Shipping Wt.	3.9 lb	(1.77 kg)

Environmental

Temperature
Operating: 0º C to +40º C (32º F to +104º F)
Storage:-20º C to +70º C (-4º F to +158º F)
Humidity
Operating: 90% maximum relative humidity non-condensing
Storage:< 95% non-condensing

Certification (Preliminary)

UL Listed
CE mark, commercial
FCC Part 15 Class A

Connectors

Front Panel
Trigger In/Out
3 Mictor™ Ports
Rear Panel
10/100 Base-TX Ethernet
+24V DC Barrel Jack
Male DB-9 Serial Port

Power

1A@24VDC, provided by desktop power supply (Included)

Contact Information

For more information on IneoQuest Technologies, Inc. and our Singulus family of products, visit our website at www.ineoquest.com or contact your local IneoQuest Technologies sales representative.

National/International Sales Office
IneoQuest Technologies, Inc.
170 Forbes Boulevard
Mansfield, MA 02048
Toll free: 1 866-464-4636
Phone: 508-339-2497
Fax: 508-339-4727
Email: sales@ineoquest.com
Website: www.ineoquest.com