Simulator 3

The Simulator 3 offers users the ability to simulate in the lab both serial and IP satellite networks. The unit provides an environment for the validation of an application or network design, before it’s deployed over a live satellite link.

Description

Satellite usage is expensive – and to combat the cost of using satellite links to develop or validation satellite-based network applications, Vocality developed the Simulator 3.

The Simulator 3 can create a network environment which represents to the connected devices all the environmental issues that a typical satcom network will present – satellite delay or latency, occasional increases in bit errors and in the IP world of today, restricted QoS and packet loss. Network attached devices such as routers, multiplexers, data cryptos and codecs can all benefit from testing within a controlled environment before live deployment over satellite.

The unit operates in one of two modes – serial or IP – and the user can switch between modes easily.

In serial mode, it can create a serial link up to 5.12Mbps, injecting delays of up to 10 seconds from end to end. Into this emulated link, the Simulator 3 can also be programmed to insert error levels or inject occasional bit or burst errors. The system can also allow engineers to fake a clock failure to examine the network recovery time.

In IP mode, the Simulator 3 can create – on a user’s bench – a network link similar to those presented by IP-based satellite networks. In this environment, bandwidth restrictions, latency and occasional packet loss are common place, but it is the role of the Simulator 3 to provide engineers a controlled environment to fine tune the configuration of the IP devices attached. Not only is satellite delay an issue affecting TCP/IP traffic, but bandwidth bottlenecks, packet re-sequencing and packet duplication are common problems affecting the efficiency of a network deployed application.

The Simulator 3 is presented with one IP port at either end, and one serial port at either end. Further IP ports can be added to create a multi-port environment, and the unit is configured
– like all other Vocality products – using the serial interface. Serial Simulation Mode is available on all units. IP Simulation Mode requires a Feature Key to operate.

Applications

Serial Simulation Mode [Fig 1.1] uses the serial ports and Ethernet Port 1 is used solely for management. This model is ideal for testing the performance of non-satellite optimised routers and multiplexers.

In IP Simulation Mode [Fig 1.2] the SIM3 is configured to act as an IP Bridge or an IP Router. It applies packet impairments as it bridges or routes packets between the two Ethernet ports. This mode is ideal for testing IP-based applications ranging from the connection of routers through to the validation of latency sensitive applications such as banking transactions, telemetry, encrypted data and so on.

A complete WAN pipe can be simulated [Fig 1.3] to recreate the typical aggregate delivered by networks such as IP satellite systems including iDirect, Inmarsat BGAN and Vipersat.
Of course, as Vocality specialises on satellite routers and multiplexers, the Simulator 3 is often used as a test platform for validating Vocality-based networks! [Fig 1.4]

**Part Numbers**

- SIM3/SERIAL  
  Simulator 3 with serial functions only enabled
- SIM3/SERIAL/IP  
  Simulator 3 with serial and IP functions enabled
- SWF/SIM/IP  
  Feature key to enable IP functions in a SIM3/SERIAL

**IP Mode – In Detail**

In a typical satellite network, the packetised nature of the IP traffic and the routing used to deliver data can be affected by a number of impairments which can seriously affect the performance of the session. The Simulator 3 may also be used to simulate a link between two LANs and builds upon its serial simulation repertoire by offering a number of packet impairments to stress test the connected application.

In IP Simulation Mode, the SIM3 is configured to act as an IP Bridge or an IP Router. It applies packet impairments as it bridges or routes packets between the two Ethernet ports on the unit. (In this mode, the Serial ports are not used).
With no synchronous clock available, throughput is limited by a throttling mechanism to replicate a wide-area network with limited capacity on its communication links. This limits the data being transmitted to a configured bandwidth, delaying and potentially discarding surplus frames. The user may configure bandwidth restriction per-Ethernet port and per-QOS Profile. As part of Bandwidth Throttling, queue sizes may be configured which represent the maximum amount of data that will be buffered if the maximum bandwidth is exceeded. In addition, the user may configure the framing overhead which is added to the packet size when the bandwidth is calculated. For example, this may include any Ethernet Pre-amble and inter-frame padding, or may just comprise the header and FCS, or could represent PPP or FR header overheads.

As with the serial simulation function, it is possible to set an overall delay which will affect the entire IP stream. However, unlike the serial simulation the packetised nature of the data allows this delay to be applied linearly, randomly or with a Gaussian distribution to all packets, on the proviso that the packet order is preserved.

In IP simulation mode, the Simulator 3 can introduce bit errors or packet errors under various timing regimes. Bit errors are more likely to be used when simulating a single connection whereas packet errors would be used when simulating a network. Packet errors may be applied with a linear or random distribution as a percentage of the packet traffic. Bit errors may be applied with a linear, random or Gaussian distribution according to the configured rate. Bit errors are introduced at the Ethernet driver Level and are therefore protocol-agnostic. They are inserted before the Ethernet CRC is calculated and so are not detected by the Ethernet controller. This creates malformed packets and simulates other corruptions in the network, which is an essential tool for stressing applications and provoking interesting behaviour in connected equipment.

Packet errors can be applied in three ways: Duplication, Discarding or Deferring. Duplicated packets are sent immediately after the original. Discarded packets are simply dropped from the data stream as a percentage of the total. Deferred packets are used to cause re-sequence to occur: additional delay is applied to individual packets, which allows other packets to overtake the delayed packet, again configured as a percentage. Multiple packet error types may be enabled simultaneously, but only one impairment will be applied to each individual packet.
The Simulator 3 allows different simulation parameters to be applied to different packet types or streams. “Quality of Service (QoS) Filters” are used to assign packets to different QOS Profiles. Each QOS Profile has its own set of simulation parameters (delay, packet error, bandwidth limit etc), and its own queue. Each profile can be thought of as a simulated path through the network, with its own unique properties. Routing packets to different QOS Profiles is another method of performing packet re-sequencing.

Configured Delays and Bandwidth restriction occur continuously. Packet and Bit Errors may be configured to occur during Burst periods, with no errors being applied during Gaps; alternatively they may be configured to occur continuously.
Applications

The Simulator 3 forms an integral part of a VSAT application or network system developer.

The unit is used in applications such as:

- Third party multiplexer or router performance over satellite links
- Multiplexer performance over satellite links
- Training staff how to work over satellite (learning how to communicate with high link latency)
- Validating time sensitive software applications such as banking or telemetry data processing

Features Summary

Mechanical
Form Factor     Desktop/shelf mount
Maximum # of modules  2
Cooling     Forced air cooling from single 30mm inlet fan
Operating Conditions  0-40degC 0-90%RH non-condensing
MTBF    >100,000hours at 40degC
Dimensions   255 x 121 x 44mm
Indicators   4 red/green for Status, Power, Port1, Port2
             2 Green (RX Carrier), 2 Yellow (RX activity) for Ethernet1, Ethernet2
Additional LEDs    8 yellow per Ethernet switch module
Max. Weight   1Kg

Electrical
Line Input Rating   9-18 V DC@4A
Consumption(max)  20W
AC Adaptor   100-240VAC 47-63Hz @ 0.6A

Serial Data ports
Number of ports   2
Presentation    DB15F HD DCE or DTE
Electrical Interfaces  RS232, V.11, V.35, V.36, RS449, RS530, RS530A
Rates     RS232
           Sync int/ext clock in 25bps multiples 1200bps to 9600bps, 800bps multiples up to 115200bps
           All others
           Sync int/ext clocks at 25bps multiples 1200bps to 9600bps, 800bps multiples to 512Kbps,
           8Kbps multiples to 5.12Mbps
Sync Format    Transparent only
Clocking
              Independent RX/TX with Internal or External (Derived) sourcing
Signal Loops   Echo, Loop
Simulation Functions

- **Delay Range**: 10mS to 10seconds step 1mS
- **Delay Accuracy**: +/-1mS
- **Error Modes**: Bit, Burst
- **Error Rates**: 1 in 100 to 1 in 1012
- **Error Distribution Modes**: Linear, Random, Gaussian(Normal), Manual
- **Signal Kills**: Data, Clocks

10/100base-T Ethernet Port

- **Number of Ports**: 2 (with fixed IP addresses)
- **Presentation**: UTP on 8-way RJ45 with auto-MDIX
- **Formats**: IEEE 802.3u(10base-T), IEEE 802.3z(100base-TX)
- **Indicators**: Green (RX carrier), Yellow (RX activity)

IP Features

- **Functions**: IPv4 static router/bridge, Static configuration of IP route table, RIP, Configurable Proxy ARP, UDP Relay for Broadcasts, Fragmentation and reassembly, QOS Profiles (Delay, Error, Priority, Bandwidth)
- **IP Packet Impairments**: Protocol Layer IP Bit Errors, Packet Duplication, Packet Discard, Packet Re-sequence

M&C Port

- **Presentation**: 6-way locking mini-DIN
- **Electrical Interface**: V.24/RS232 serial
- **Format**: Async up to 115200bps
- **Protocol**: Formatted terminal emulation/Telnet or TTY mode
Service and Support

Telephone and email support for your Vocality equipment is available by contacting one of our three locations around the world (listed on the back page of this document). The manuals for all Vocality equipment is available free of charge to download from the Vocality web site – available by completing the online form. Visit www.vocality.com and select support for more information.

Vocality equipment carries a 12 month return to base warranty. The warranty can be extended by purchasing an Extended Warranty for the equipment.

In addition to the usual support facilities, Vocality also offers training in all three office locations. For more information on training costs and timetables, email sales@vocality.com
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