AccessionIndex: TCD-SCSS-T.20141120.004
Accession Date: 20-Nov-2014
Accession By: Dr.Brian Coghlan
Object name: SCI Tracer
Vintage: c.1998
Synopsis: PC/AT compatible luggable instrument for monitoring IEEE 1596-1992 SCI interconnect, designed and constructed in the Dept.Computer Science, TCD. S/N: TANV392M025.

Description:
The Scalable Coherent Interconnect (SCI) was a high-speed point-to-point packet-switched cluster interconnect for cache-coherent distributed shared memory multiprocessing, approved as IEEE Standard 1596-1992 on 19-Mar-1992. The standard included executable C-code (by David V.James), and its coherence protocol had been formally verified (by Stein Gjessing et al, University of Oslo). Dolphin Interconnect Solutions, Oslo, then implemented several generations of SCI chips.

The 64-bit SCI address space was partitioned using the top 16-bits to designate up to 64k nodes, each with a 48-bit (256TB) address apace. Nodes had input and output links. The basic topology was a ringlet, but switches could mediate between ringlets. A fully switched topology had ringlets of 2 nodes, one of which was on the switch. SCI exchanged information in packets, each a sequence of 16-bit symbols with a header for address, command and status information, a payload and a checksum. If the first symbol (destination) arriving on a node's input link implied the packet was for that node, the packet was routed to its receive queue, otherwise it was routed to the output link via a bypass FIFO. Ringlets were 'cleaned' of packets that had circulated twice by an elected 'scrubber' node.

Two of these instruments were designed and constructed in the Dept.Computer Science, TCD, by Dr.Brian Coghlan and Dr.Michael Manzke for monitoring the SCI interconnect, with funding by the EU SCIEurope project P25257, although they were not limited to SCI, and could provide general purpose deep trace facilities.

The instrument was implemented within a PC/AT compatible "luggable" or "lunchbox" computer (made by <***yet to be established***>), incorporating an LCD display, which the keyboard latched over to pack into a leather carrying case for transport. The computer was designed to accommodate a standard AT motherboard with ISA, EISA, PCI, PCI-X or PCI-e I/O cards. Its 1024 x 768 SVGA LCD display was driven by a proprietary I/O card.

Traces could be acquired via an SCILabs SCI link tracer, connecting via cables designed for a HP16500 series logic analyser. Alternatively, traces could be acquired via a probe card (supplied by Dolphin) that attached to their SCI cards via elastomeric connectors, again connecting via cables designed for a HP16500 series logic analyser. In principle avionics SCI cards could be similarly connected. In all cases the far end of these cables connected to a Probe Adapter designed by TCD that sampled the signals then sent this data to a pair of Deep Trace boards (also designed by TCD) that were plugged into the luggable PC. The two trace boards functioned as deep FIFOs. Data was sampled and stored in a VRAM buffer which wrapped around and could be read out via an EISA interface without stopping the sample clock.

A trigger mechanism provided four-level triggering and also a filtering facility. The two trace boards were interconnected to synchronise triggering over the full width of the acquired trace data. Two of these instruments could be connected for synchronised SCI data acquisition from two nodes and then the two traces could be correlated in a subsequent SCI data analysis.

The trace system software components directly related to the hardware. Windows 95 & NT trace board drivers provided an underlying mechanism for an SCI Trace Instrument API that allowed all the required trace hardware manipulations (e.g. trace data retrieval through the EISA instrument bus, trigger definition, etc). An SCI Trace Instrument User Control Interface GUI used the API to provide the user with an interface to control the trace hardware. When instructed to do so, trace data was retrieved from the trace hardware then decoded and imported into an SCI Trace Database. This database could be local or remote. The database tables represented all the SCI packet types. Trace data analysis was performed through SQL queries of the database. All the application software was implemented in Java, and JNI was used to interface the Java-code with the native trace hardware API.

Accession Index	Object with Identification
TCD-SCSS-T.20141120.004.01	IBM PC/AT-compatible Luggable Computer. S/N: TANV392M025
TCD-SCSS-T.20141120.004.02	DT200.1 Deep Trace Memory Board (1).
TCD-SCSS-T.20141120.004.03	DT200.1 Deep Trace Memory Board (2).
TCD-SCSS-T.20141120.004.04	DT205.1 Probe Adapter (1).
TCD-SCSS-T.20141120.004.05	DT205.1 Probe Adapter (2).
TCD-SCSS-T.20141120.004.06	DT204.1 Trace Probe (1).
TCD-SCSS-T.20141120.004.07	DT204.1 Trace Probe (2).

References:

1. Wikipedia: http://www.wikipedia.org/.

2. Manzke, M., Coghlan, B.A., "Non-Intrusive Deep Tracing of SCI Interconnect Traffic", Proc.SCIEurope’99, p.53-58, Toulouse, September 1999.

See the extensive set of documents in the related folder in this catalog.

Figure 1: SCI Tracer three-quarter view

Figure 2: SCI Tracer (a) left and (b) right side views
(without DT200.1 Deep Trace Memory Boards)

Figure 3: SCI Tracer rear top view

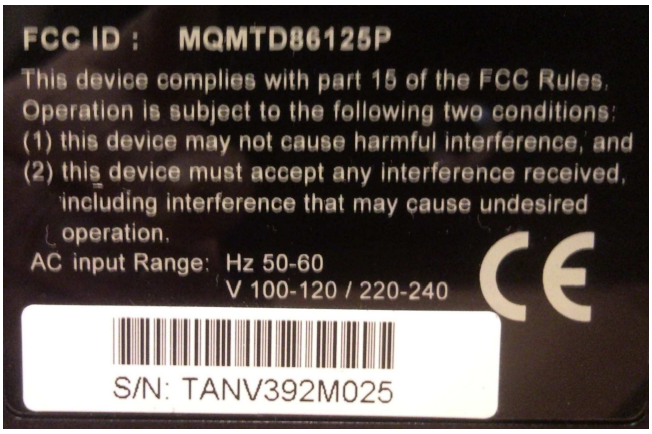

Figure 4: SCI Tracer manufacturing label

Figure 5: SCI Tracer in its carrying case, (a) open and (b) closed

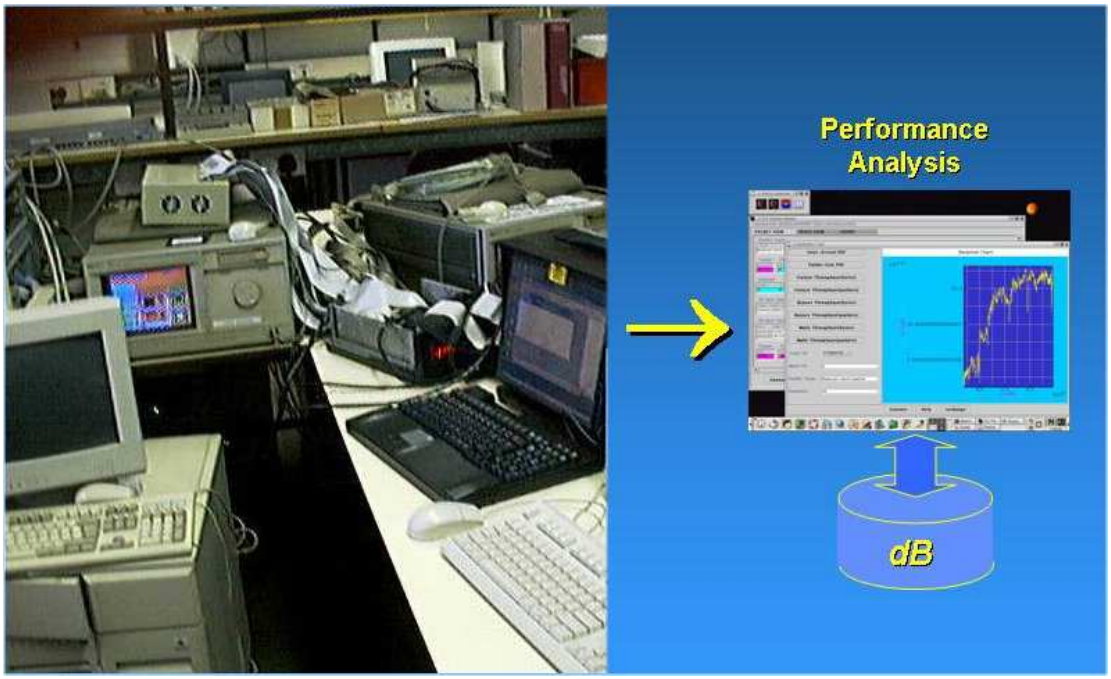

Figure 6: SCI Tracer in use for performance monitoring via SCILabs SCI link tracer

Figure 7: SCI Tracer in use for performance monitoring via Dolphin probe card

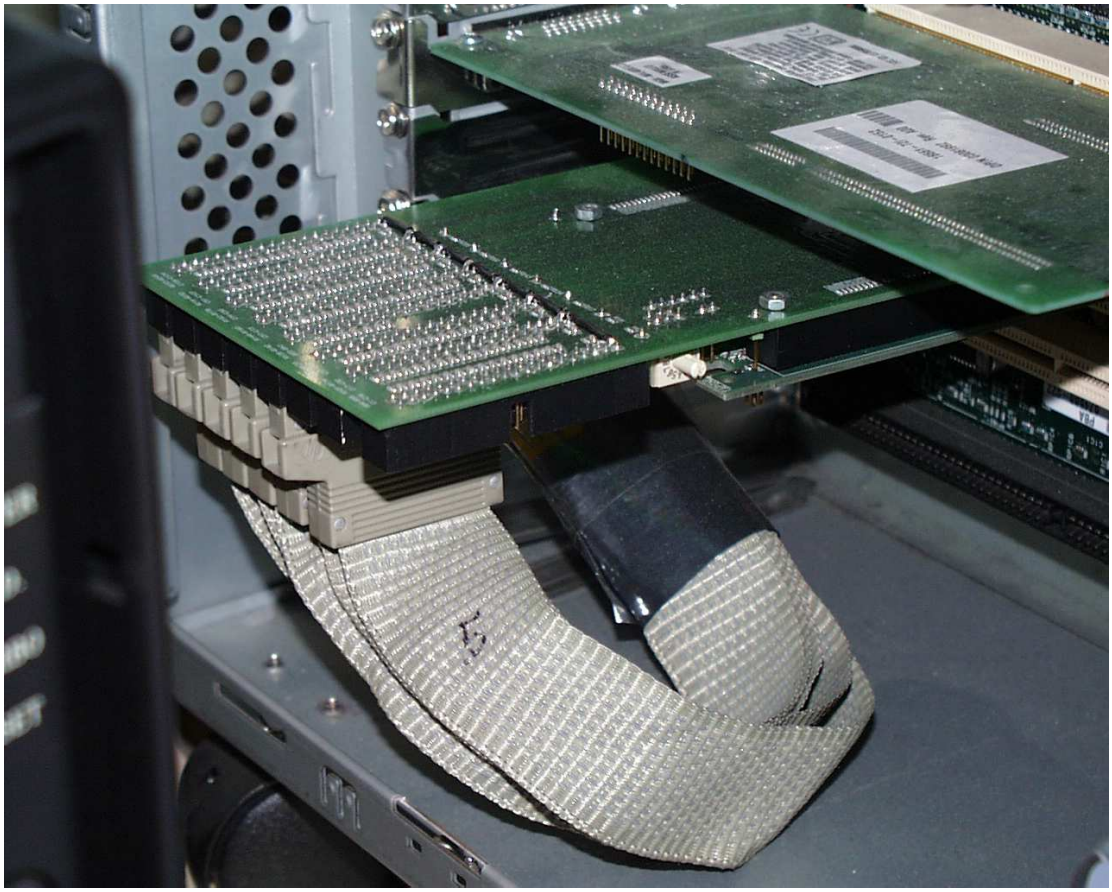

Figure 8: SCI Tracer connections to probe card supplied by Dolphin

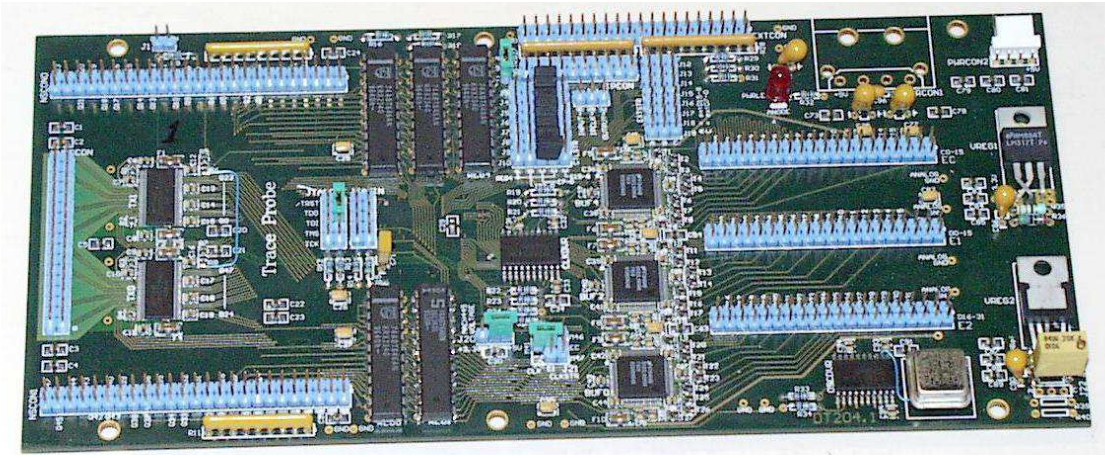

Figure 9: DT204.1 Trace Probe
Three horizontal connectors at right connect to Dolphin probe card
Vertical connector at left connects to DT205.1 Probe Adapter

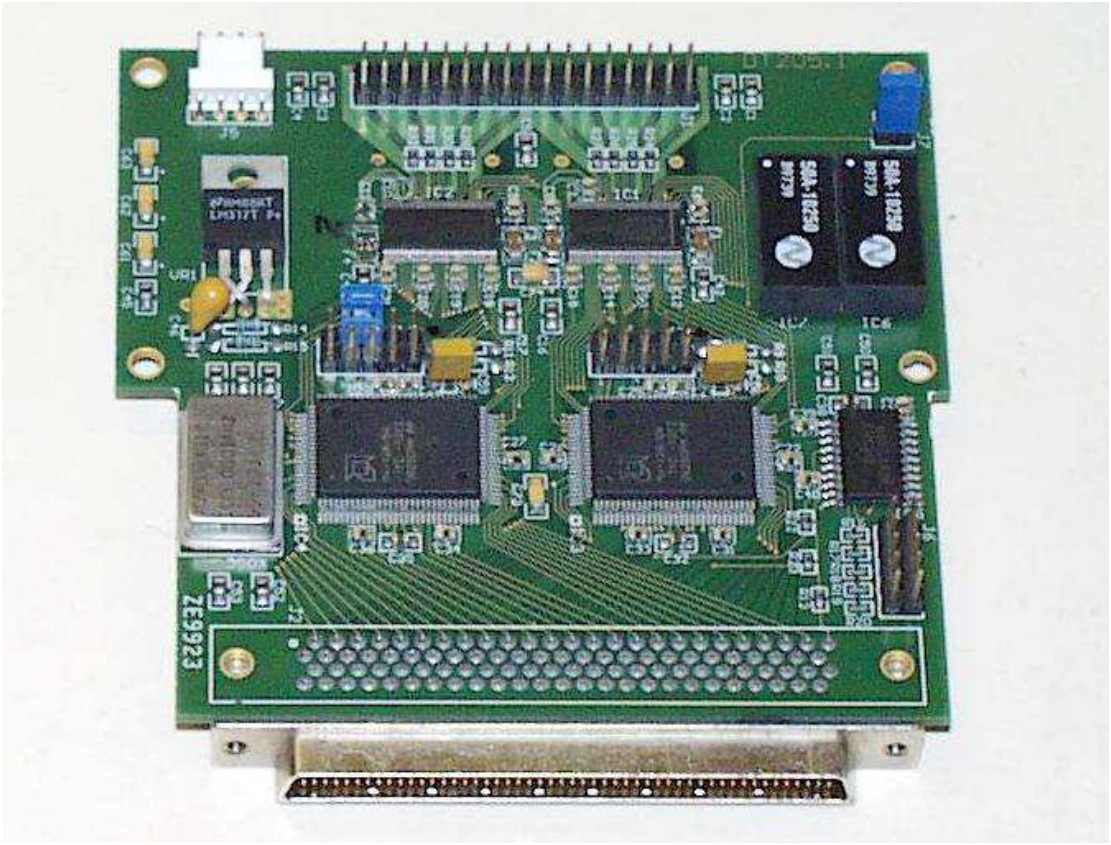

Figure 10: DT205.1 Probe Adapter

Figure 11: SCI Tracer connections to DT205.1 Probe Adapters

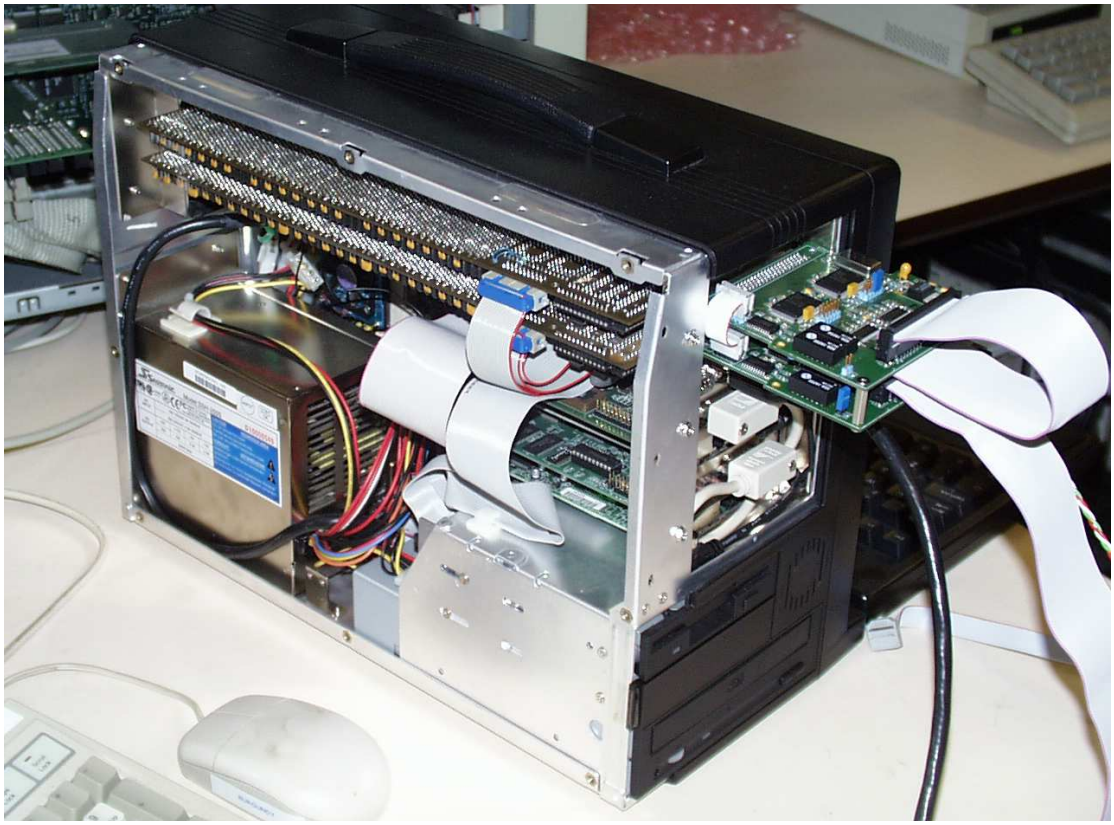

Figure 12: SCI Tracer rear three-quarter internal view
The two DT200.1 Deep Trace Memory Boards are at top

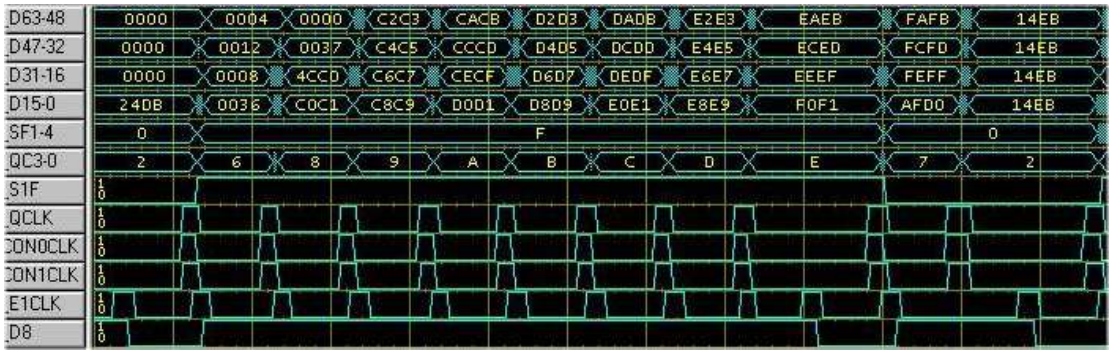

Figure 13: Typical SCI packet

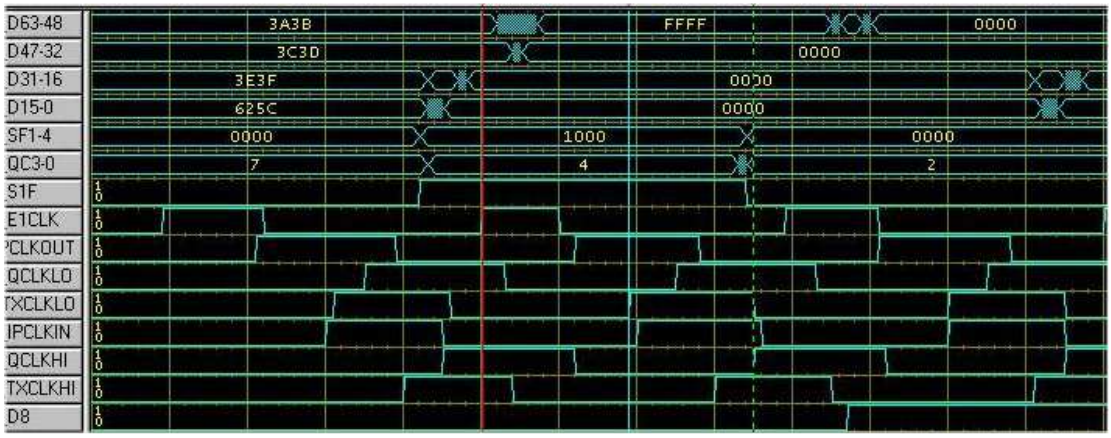

Figure 14: Typical SCI sync packet

Figure 15: SCI Tracer in action, showing GUI

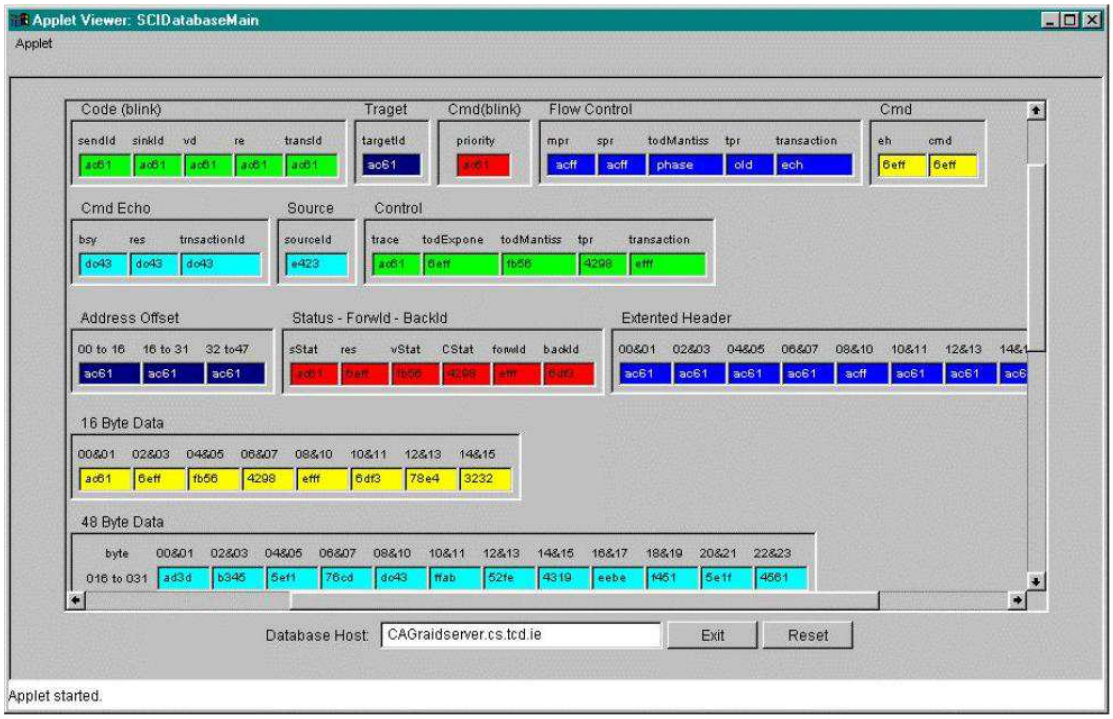

Figure 16: SCI Tracer packet viewer

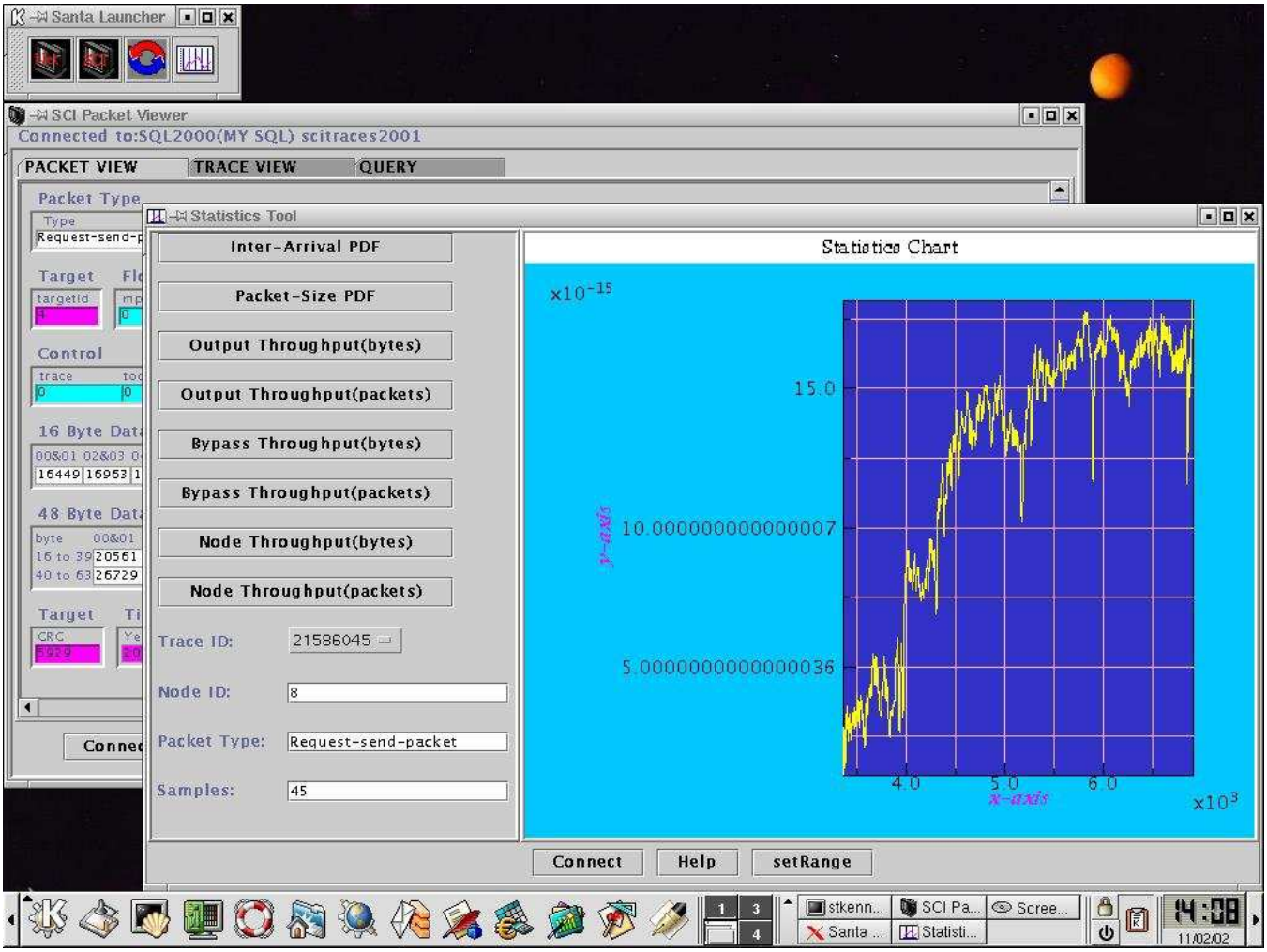

Figure 17: SCI Tracer trace database analysis