AccessionIndex: TCD-SCSS-T.20121208.066 Accession Date: 8-Dec-2012 Accession By: Dr.Jeremy Jones Object name: Trinity Workstation Vintage: c.1986 Synopsis: First Irish-designed UNIX system.

Description:

The Trinity Workstation (TWS) was the first Irish-designed UNIX system, designed by a team led by Dr.Jeremy Jones in the Department of Computer Science. The hardware design was by Stephen Brooks, and software by Richard Holbrook, both as part of their respective M.Sc theses, supervised by Dr.Jones. Ten of these systems were made and used in the department. One system was extended for symmetric multiprocessing.

The TWS was based on National Semiconductor's NS32332 CPU, an evolution of their NS32000 series microprocessors. When the TWS design was begun, the NS32332 was a very new processor and not yet generally available, but the TWS designers were fortunate to have a good relationship with National Semiconductor, who donated an unmarked early version of the chip (see Figure 2), presumably from a pre-production run, for the initial wire-wrap prototype.

The challenge was to design and develop a high performance UNIX workstation which was networked and highly extensible. This would enable it to be utilised as a platform by other research projects in the department. Other computers in use at the time were very narrow in focus and limited in capability. Such specialised computers were used for: word processing, teaching programming techniques or conducting research into multiprocessing, operating systems, databases and computer vision. Machines used for one purpose would typically not be used or be capable of being used for other purposes. Having a high-performance platform which could be extended with special-purpose plug-in modules, e.g. for computer vision or connected to a network of Transputers, while offering a UNIX environment and all of the associated programming, debugging and development tools and facilities that come with that, together with TCP/IP Ethernet connectivity, was seen as a desirable enabler for the research activities of the department.

The extensibility and connectivity possibilities included:

- The VMEbus (Versa Module Europa bus). This enabled the TWS to be used as a development environment for research activities involving any hardware which had a VMEbus interface. Such hardware could simply be plugged into the VMEbus backplane of the TWS and then controlled from there.
- TCP/IP Ethernet connectivity, enabling the TWS to communicate with other computers on the local area network and beyond. This capability was used by the COMANDOS project for research into distributed operating systems.
- An Inmos C012 link adaptor enabling the TWS to connect to Transputer nodes thereby facilitating multiprocessing research.
- A Small Computer Systems Interface (SCSI) for connecting disk drives, tape drives etc.
- Two asynchronous serial I/O (RS232) ports.

• Two additional ports for either synchronous or asynchronous serial I/O. These could be used for multiple protocols including Bi-Sync and SDLC/HDLC.

The TWS ran National Semiconductor's "Genix" (a port of UNIX to their NS32000 series microprocessors). A good deal of additional porting of this software to the TWS hardware platform was necessary, and this was principally done by Richard Holbrook.

Physically the TWS was constructed as three interconnected Eurocard boards that plugged into a VME backplane in a Eurocard chassis on castors, along with SCSI disk drives and a 350W switching power supply. Connections for terminals, network, etc, were on the front edge of the boards.

Accession Index	Object with Identification
TCD-SCSS-T.20121208.066.01	Trinity Workstation Chassis.
TCD-SCSS-T.20121208.066.02	Trinity Workstation CPU module.
TCD-SCSS-T.20121208.066.03	Trinity Workstation Memory module.
TCD-SCSS-T.20121208.066.04	Trinity Workstation I/O module.
TCD-SCSS-T.20121208.066.05	Weir SMM350 PSU.
TCD-SCSS-T.20121208.066.06	National Semiconductor NS32332, early unmarked revision.

Many thanks to Stephen Brooks for writing this description, and Stephen Brooks and Seamus Guiry for photographs.

References:

- 1. Stephen M.Brooks, "The design of the Trinity Workstation", Thesis 1843, Berkeley Library, Trinity College Dublin, 1989.
- 2. Richard Holbrook, "The UNIX operating system: two implementations", Thesis 2229, Berkeley Library, Trinity College Dublin, 1990.



Figure 1: Trinity Workstation early wire-wrap prototype top view



Figure 2: National Semiconductor NS32332, early unmarked version



Figure 3: Trinity Workstation early wire-wrap prototype bottom view



Figure 4: Trinity Workstation early wire-wrap prototype under test



Figure 5: Trinity Workstation early wire-wrap prototype under test



Figure 6: Trinity Workstation final wire-wrap prototype bottom view



Figure 7: Trinity Workstation front view



Figure 8: Trinity Workstation front internal view



Figure 9: Trinity Workstation under test



Figure 10: Trinity Workstation board set three-quarter view



Figure 11: Trinity Workstation CPU board top view



Figure 12: Trinity Workstation memory board top view



Figure 13: Trinity Workstation I/O board top view



Figure 14: Some members of the Computer Architecture Group at time of TWS design and development Back row: Seamus Guiry, Padraig Dooley, Peter Meehan, Andrew Butterfield Front row: Eamon Kelly, Brendan Kiernan, Stephen Brooks, Dr.Jeremy Jones