Astronomical Data Analysis Software and Systems IX
ASP Conference Series, Vol. 216, 2000
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Real Time Linux — The RTOS for Astronomy?

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Abstract. The BoF was attended by about 30 participants and a free CD of real time Linux—based upon RedHat 5.2—was available. There was a detailed presentation on the nature of real time Linux and the variants for hard real time: New Mexico Tech's RTL[1] and DIAPM's RTAI[2]. Comparison tables between standard Linux and real time Linux responses to time interval generation and interrupt response latency were presented (see elsewhere in these proceedings). The present recommendations are to use RTL for UP machines running the 2.0.x kernels and RTAI for SMP machines running the 2.2.x kernel. Support, both academically and commercially, is available. Some known limitations were presented and the solutions reported e.g., debugging[3] and hardware[4] support.

The features of RTAI (scheduler, fifos, shared memory, semaphores, message queues and RPCs) were described. Typical performance statistics were presented: Pentium-based oneshot tasks running > 30kHz, 486-based oneshot tasks running at ~ 10kHz, periodic timer tasks running in excess of 90kHz with average zero jitter peaking to $\sim 13\mu s$ (UP) and $\sim 30\mu s$ (SMP). Some detail on kernel module programming, including coding examples, were presented showing a typical data acquisition system generating simulated (random) data writing to a shared memory buffer and a fifo buffer to communicate between real time Linux and user space. All coding examples were complete and tested under RTAI v0.6 and the 2.2.12 kernel.

Finally, arguments were raised in support of real time Linux: it's open source, free under GPL, enables rapid prototyping, has good support and the ability to have a fully functioning workstation capable of co-existing hard real time performance. The counter weight—the negatives—of lack of platforms (x86 and PowerPC only at present), lack of board support, promiscuous root access and the danger of ignorance of real time programming issues were also discussed. See

ftp://orion.tuc.noao.edu/pub/pnd/rtlbof.tgz for the StarOffice[5] overheads for this presentation.

[1] `http://www.rtlinux.org`

[2] `http://www.aero.polimi.it/projects/rtai`

[3] `http://www.zentropix.com/products/devtools/r2d2.html`

[4] `http://stm.lbl.gov/comedi`

[5] `http://www.sun.com/dot-com/staroffice.html`