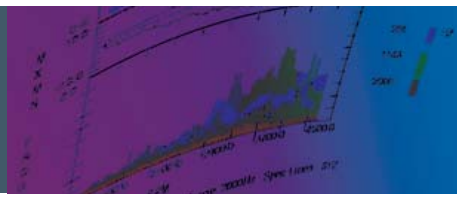
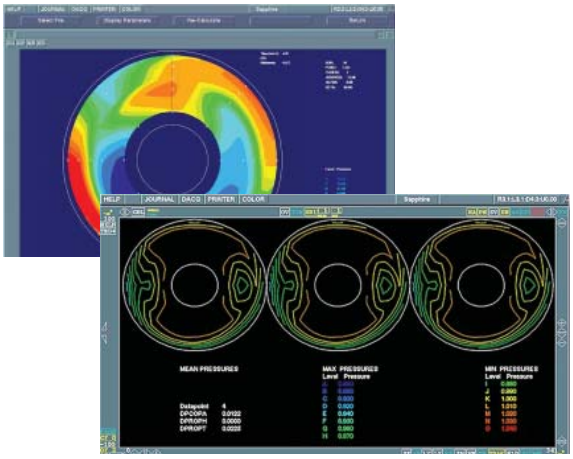
Cranfield Data Systems on the Fast Track with LynxOS



A division of Cranfield Aerospace Ltd., Cranfield Data Systems (CDS) produces real-time data acquisition and signal processing hardware and software for vibration, shock, acoustics, fatigue, modal, and rotating machinery analysis. The company provides a variety of advanced instruments, including customized data acquisition and analysis solutions for leaders in the aerospace, automotive, and power-generation industries.

CDS's flagship M6000 data acquisition system is a high-performance, expandable signal processing system configurable to individual client requirements. Capable of collecting up to 195K data samples per second, per channel, it represents a new benchmark in sophisticated dynamic analysis solutions.



Real-time display of inlet pressure contours and distortion coefficients.

Data acquisition systems typically measure the structural and mechanical integrity of dynamic environments, such as vibration, noise, and shock, in rotating machinery ranging from gas turbine engines to undercarriages to wheels, and require significant computational power for data analysis.

CDS's M6000 data acquisition system is a multi-function signal-processing and monitoring unit designed for a variety of engineering environments, including aircraft and automotive systems that permit computationally intensive signal analysis to occur simultaneously with continuous high-throughput data acquisition. The product is expandable from 32 to 256 input channels. In large-scale structural testing, in which more than 256 channels are required, multiple systems are networked using high-speed fiberoptics to provide an unlimited total channel count.

High Performance at a Premium

Historically, Cranfield Data System's data acquisition software applications were designed to run on a proprietary computer system, proprietary processor architecture, and a proprietary RTOS from a single supplier. However, maintaining the performance level its customers demanded while remaining profitable proved an ongoing challenge, prompting the company to consider commercial off-the-shelf (COTS) products that could respond to events in real time and in an environment that clients found familiar and approachable.

"We wanted a UNIX® operating system capable of supporting existing applications and drivers, along with an RTOS with a fast, deterministic response time," said Ian Norton, system designer at CDS. In addition, the software foundation for the data acquisition application had to provide both a simple path for system upgrades and a flexible environment allowing CDS's customers to continue to integrate their own programming as they had done with previous system iterations.

After evaluating several RTOS solutions, CDS turned to LynuxWorks'™ LynxOS® real-time operating system for the hard

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Ian Horton, Systems Designer, Cranfield Data Systems

real-time response necessary to achieve the high-speed performance required by the M6000. "We found a software foundation that is not only more efficient and economical than what we had previously used, but also one that exceeded our initial performance specifications by a factor of twenty," said Norton. In fact, LynxOS achieved a preferred data processing rate of better than one millisecond.

A Complete Solution

LynxOS blends performance, reliability, and scalability with patented technology for real-time event handling. The application programming interfaces to the OS and have been written to be compatible with Linux® and UNIX and are fully POSIX.1, .1B and .1C-conformant. With a fully preemptible kernel featuring fast, deterministic context switching, combined with LynuxWorks' dedicated support, LynxOS matched CDS's system requirements. Moreover, because LynxOS supports a broad platform of architectures, CDS engineers could select the optimum combination of third-party hardware upon which to run their powerful software applications.

With LynxOS running on PowerPC® G4 processors, the company produced systems that surpassed customer performance requirements while saving valuable dollars. "LynxOS provided the performance of a proprietary solution with the flexibility of a COTS design approach," said Norton.

Exceeding Expectations

M6000 workstations are regularly applied to a range of environmental monitoring tests. In a recent implementation, three M6000 systems were networked to create an industrial turbine engine monitoring system. Here, two systems acquired data from 128 channels over a 20 KHz frequency range (50 KHz per channel), and data from each was merged and made available to the third system. Using onboard vector processors from the PowerPC CPU, the first system then processed data from all channels in the frequency domain to produce real-time alarm displays. Critical to the operation was the nonstop, concurrent saving of all time domain data to digital tapes at a full bandwidth rate of 12.8 Mb/s. The 400 MHz CPU was 85% utilized while simultaneously handling realtime interrupts at approximately 3 KHz. According to Norton, the successful implementation of this system was only possible due to the multithreaded deterministic characteristics of LynxOS.

A Commitment to Success

CDS's migration to LynxOS involved porting the drivers, including analog input-output systems, and developing new drivers for special applications, such as networking. "Migrating CDS's software

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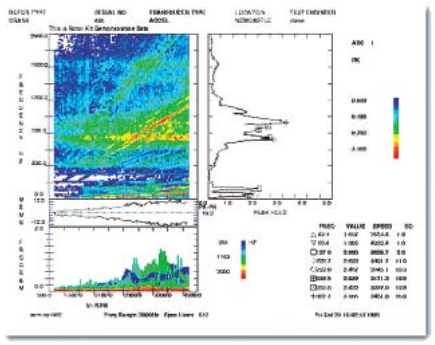
a product with the level of performance consistent with our reputation, and at a price that is both competitive and profitable," said Norton. "LynuxWorks' flexible approach and dedication to customer support have ensured that we've met all of our customer obligations."



Composite from aXromas showing engine orders, peak hold, amplitude tracking and max/min., vital parameters for reliable engine monitoring. The high-speed performance of the M6000 and LynxOS ensures all data is processed during high-speed ACCELS.

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