Benchmarking Overall System Throughput with Application Simulator and DriverLINX

Introduction

Software applications for data acquisition must maintain a balance between input and output processes. The input process is the rate at which data arrives from the measurement hardware. The output processes would be manipulation of the data such as conversion to engineering units or computation of FFT, data display for status prompts or results back to the operator, and data streaming for storage of results on the computer's hard disk drive.

When the sum of the time required for output processes is too long relative to the input process, the acquisition is not sustainable.

Keithley provides an Application Simulator program that can aid you in benchmarking the input and output processes when using plug-in board products supported by a 32bit DriverLINX driver. It allows you to exercise the analog input portion of a compatible plug-in board.

This guide is a brief walk through of how to use this application and interpret the results.

How to obtain the Application Simulator

The Application Simulator can be downloaded free of charge from the Keithley web site. It is listed as a software download for any of the compatible analog input plug-in boards supported by a compatible version of DriverLINX. Once installed, it will be available from the Start >> Programs >> DriverLINX >> Test Panels >> Application Simulator.

Below is a listing of compatible boards.

ISA Bus: DAS-1701AO, DAS-1702AO, DAS-1702HR, DAS-1702HR-DA, DAS-1701ST, DAS-1701ST-DA, DAS-1702ST, DAS-1702ST-DA, DAS-1801AO, DAS-1802AO, DAS-1801HC, DAS-1802HC, DAS-1802HR, DAS-1802HR-DA, DAS-1801ST, DAS-1801ST-DA, DAS-1802ST, DAS-1802ST-DA, DAS-800, DAS-801, DAS-802

PCMCIA: KPCMCIA-12AI-C, KPCMCIA-12AIH-C, KPCMCIA-12AIAO-C, KPCMCIA-12AIAOH-C, KPCMCIA-16AI-C, KPCMCIA-16AIAO-C

PCI bus: KPCI-3107, KPCI-3108, KPCI-3101, KPCI-3102, KPCI-3103, KPCI-3104, KPCI-1801HC, KPCI-1802HC, KPCI-3116, KPCI-3110

Using the Application Simulator

For the results shown below, a KPCI-3104 was used. The DriverLINX version is 3100-850A03 and the operating system is Windows 2000 SP1. The computer is a PIII-933MHz with a Western Digital hard disk (Gateway E-3400).

The first step is to set up the properties of the test. Click the properties icon or use the menu (Edit >> Properties). The screen below will be displayed.
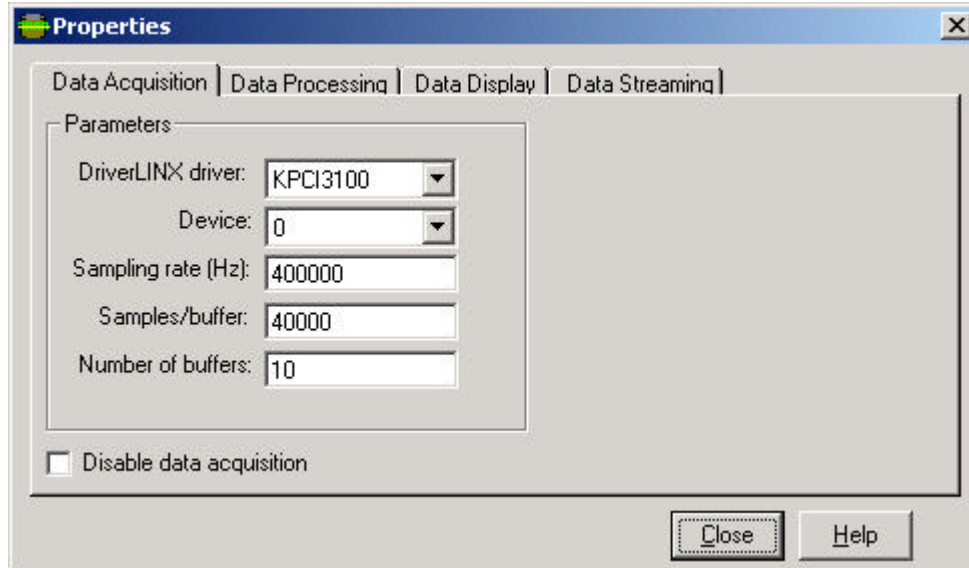
The combination of Sample Rate, Samples/Buffer and Number of buffers are such that:

- a buffer will be filled each 100 msec
- total buffering is equal to 1 second worth of sampling (ten buffers of 100 msec each)

The other tabs of the Properties dialog allow for addition of time for Data Processing (suppose you plan a complex digital filtering computation), Data Display and Data Streaming (to hard disk file). The help menus of the Application Simulator explain the various settings available on these tabs.

Results

After running this application, the first section under Application Statistics gives a break down of how much time is required for each data presentation and data storage step (output processes). The sum of these times is a little more than 21 msec. Since new data arrives at a much less frequent interval (100msec), our application is very well balanced and we can expect a robust and sustained acquisition.
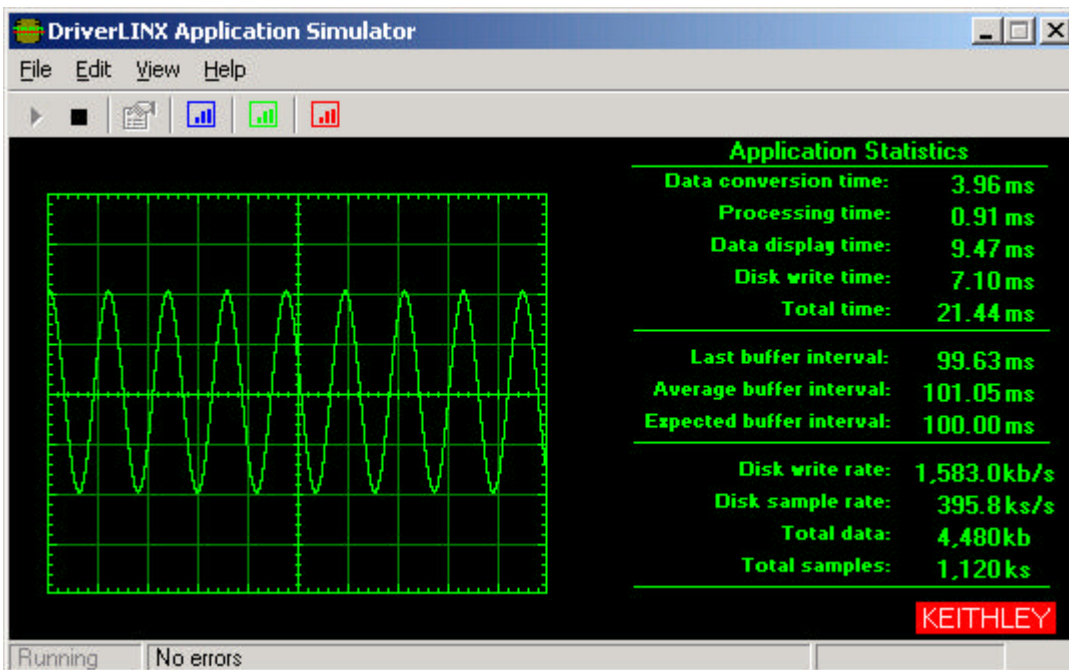
Total Time is less than buffer interval

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The screen shot below shows some detailed statistics from this set up. The small graph objects in the menu allow you to see a histogram of the actual rates. Below is the histogram for the buffer interval. Consistent with the sampling parameters, the buffers arrive at approximately 100 msec. They do not arrive at exactly 100 msec intervals because Windows is not a deterministic operating system.
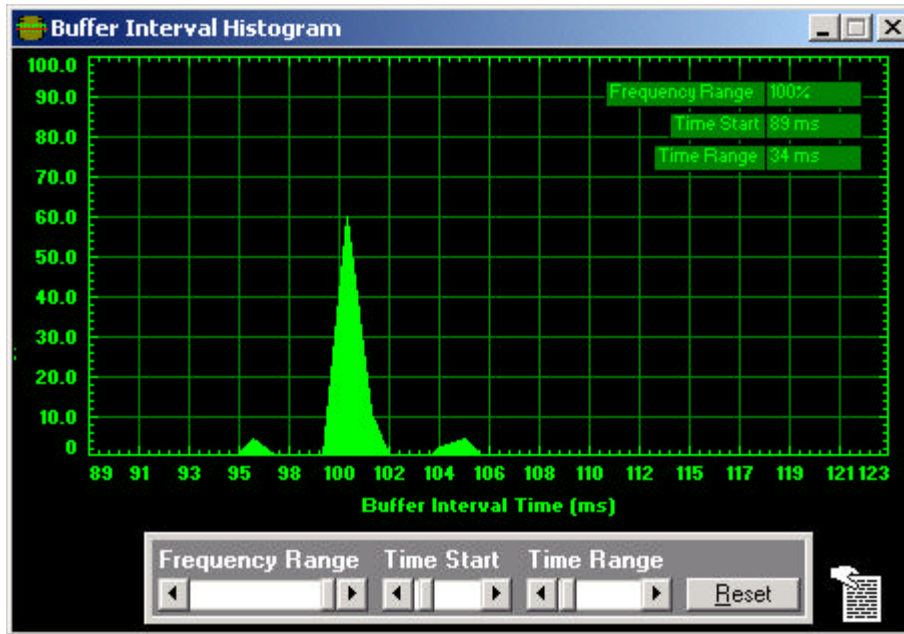
In contrast, these same application parameters were attempted on a relatively old computer: a Pentium-Pro 200 MHz. In this case, the sum of the output processes exceeds the 100 msec buffer interval time. In particular, time to access the hard disk drive increased to over 80 msec. In this case, the acquisition is not sustainable. Different hardware better suited to the demands of the application are called for although increasing the buffer size might allow for a new balance point between the rate of data arrival and data departure.