

LabVIEW@GSI

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DVEE started the evaluation of LabVIEW (National Instruments, NI¹) as a tool for the development of slow control systems for experiments of small and medium size in 1999. During the past years the use of LabVIEW in research and industry has strongly increased. For GSI, the main advantages of using NI software are the following: First, NI provides both hard- and software. By this, the time consuming development of low level drivers is not an issue any more. Second, it provides efficient tools for the development of graphical user interfaces (GUIs). Finally, LabVIEW, being a graphical programming language, eases the software development even for inexperienced programmers. As a result, software development with LabVIEW becomes more efficient and less time consuming for many cases. The maintenance and further development of existing LabVIEW based systems is rather easy.

LabVIEW is the method of choice for software development when PC hardware with Microsoft operating systems can be used. Even real time applications can be implemented using embedded systems from NI. Interfaces to access VXI/VME and CAMAC hardware from a PC based system is made possible by hardware provided by NI. This gives access to legacy hardware that is widely used in research.

LabVIEW is also available for Linux and the number of supported hardware interfaces is continuously growing. However, porting the LabVIEW applications itself to other operating systems like LynxOS, which are not supported by NI, is almost excluded.

At GSI, DV&EE is involved in several LabVIEW projects required for physics experiments:

- TargetScanner², Target Laboratory [1].
- SHIPTRAP³, Atomic Physics
- Life time measurements in Cave A, Atomic Physics
- PHELIX⁴, Atomic Physics
- Detector test, Detector Laboratory

For these projects different hardware and field-busses are supported.

- NI Flex- and Value-Motion, with a MOVTEC power amplifier for stepper motors
- NI IMAQ⁵ to acquire images from different analog and digital cameras
- CAN bus to control high voltage modules (iseg)
- GPIB to control local and remote GPIB devices
- NI FieldPoint to control digital and analog I/O via Ethernet
- Profibus via an interface from COMSOFT
- CAMAC and VME

All this hardware can easily be accessed via LabVIEW, which is an integrated development environment. LabVIEW also

includes powerful libraries and add-on toolkits that help to efficiently set-up control systems:

- SQL- and Internet-Toolkit to access data bases and networks.
- Statistical Process Control for quality assurance of continuous processes
- PID and Fuzzy-Toolkit for closed loop control
- Advanced IMAQ Vision library for image processing and analysis
- Data Logging and Supervisory Control (former BridgeVIEW) for alarm and event handling, online and historical trending and security

We use these tools to develop prototype applications and instrument drivers in LabVIEW. Most of these projects are maintained using a build-in Source Code Control System that is part of the LabVIEW environment. More detailed information can be found on the web, <http://www-wnt.gsi.de/LabVIEW>.

The EPICS ActiveX Channel Access Server library [2] for LabVIEW was successfully evaluated for HADES⁶.

The Data Logging and Supervisory Control Module (former Bridgeview) for LabVIEW provides OPC client and server functionality that can be used to set-up communication with commercial OPC servers like the one from COMSOFT for a Profibus controller.

There are two more NI software packages to mention. LabWindows/CVI is the C based analogue to LabVIEW and ComponentWorks++ provides C++ libraries and GUI elements which can be used with other C/C++ development environments like Microsoft Visual Studio.

To provide CAMAC access over the network we used those packages to implement the ESONE client library on Windows via a C/C++ DLL. The MBS⁷ [3] provides the ESONE server. For this purpose the ONC RPC software package was used. It implements SUN Remote Procedure Calls for Windows using the XDR format (External Data Representation. Microsoft RPC uses NDR format, Network Data Representation, which is not compatible with XDR). A wrapper library for LabVIEW is supported too. VME is also easily accessible via a VME-MXI-2 Controller from NI.

To summarize, LabVIEW from NI provides powerful software tools for the implementation of PC based control systems. At GSI it is currently mainly used for small and medium sized experiments.

References

[1] H.Brand et. al., "Project Targetscanner – A Status Report", GSI Annual Report 2000

[2] Kai-Uwe Kasemir, <http://mesa53.lanl.gov/lansce8/epics/PC/>

[3] H.G. Essel und N. Kurz, „The General Purpose Data Acquisition System MBS“, IEEE TRANSACTION ON NUCLEAR SCIENCE, VOL. 47, NO. 2, APRIL 2000

⁶ <http://www-hades.gsi.de>

⁷ Multi Branch System

¹ <http://www.ni.com>

² <http://www-wnt.gsi.de/TargetScanner>

³ <http://www-aix.gsi.de/~shiptrap>

⁴ <http://www-aix.gsi.de/~phelix>

⁵ IMAQAcquisition