lvPortDriver

a platform independent interface between LabVIEW software and EPICS device support

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GOAL: Platform Independent Interface for LabVIEW code running on an IOC

- **Currently many solutions**
  - Cosylab “shared memory” (cRIO - VxWorks)
  - SNS Shared memory (Windows)
  - Several solutions that allow LabVIEW to communicate via Channel access
- **Need a solution for Linux RT (cRIO)**
- **Solution should be useable everywhere.**
  - All operating systems that support EPICS and LabVIEW
  - Feature-rich enough to replace all existing methods.

What Is lvPortDriver?

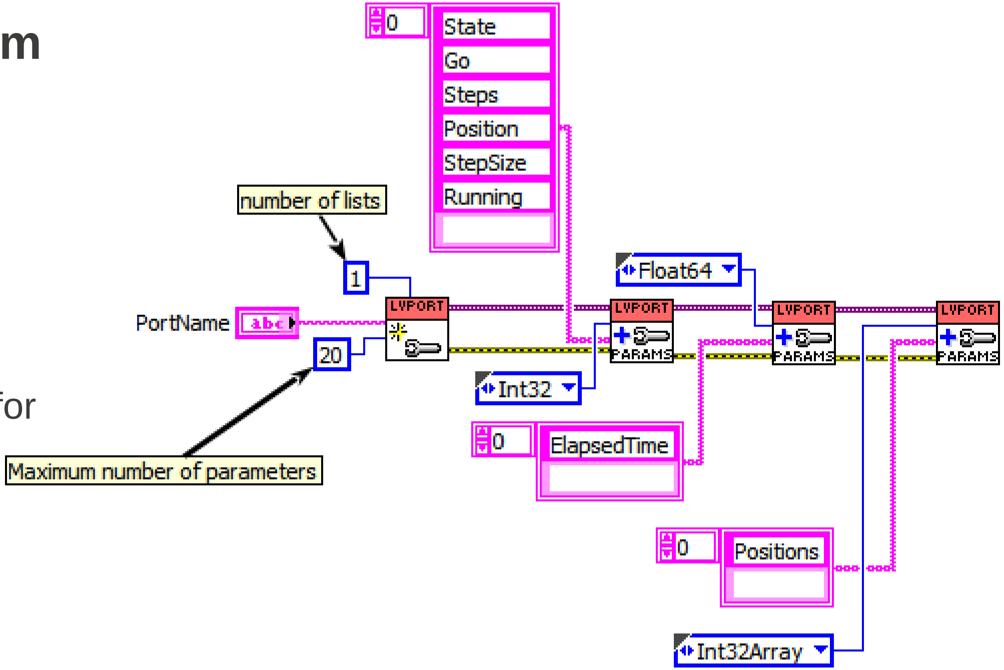
- **A C++ class and LabVIEW virtual library that allows one to write an asynPortDriver entirely with LabVIEW code.**
- **The IOC (built as a shared library) is then started by the LabVIEW code**
  - This means the EPICS IOC and the LabVIEW program run as the same process on any operating system, and don’t need to setup operating system specific shared memory.

Features

- **Currently Supported.**
  - All standard data types including Arrays.
  - Setting/getting asynStatus for a parameter.
  - LabVIEW subscribe as an asynclient to receive user events when parameters change.
    - Events include value and status.
- **Not Yet.**
  - Area Detector
    - Generic pointer is supported by the C++ class, but no LabVIEW Vis have been written.
  - Asynchronous record processing.
    - Write functions just store the value in the parameter library
    - It would be possible to do this differently, but I'm not sure how helpful this is.
  - Non-default GetBounds support
    - Could be implemented, but why not just use SLOPE conversions?
  - Waveform of Strings???

Configuring Device Support

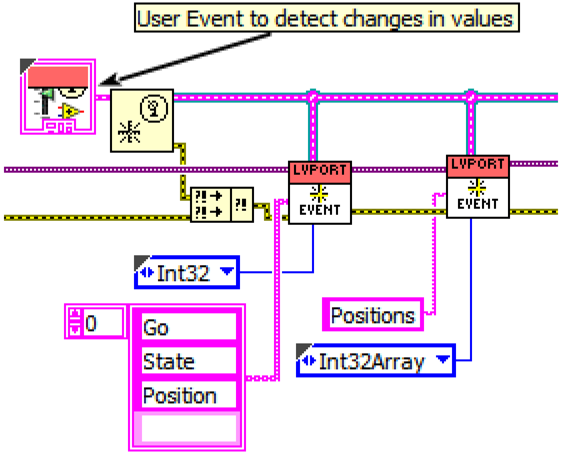
- **Configure port names, maximum number of parameters, and number of parameter lists.**
- **Then add parameters of each type.**
  - All supported asyn types.
    - LabVIEW code not yet implemented for handling generic pointer.

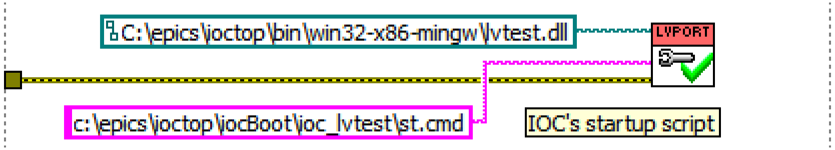


User Events and IOC startup

- **Can register for user events that occur on value change.**
  - – Uses the asyn client interface.

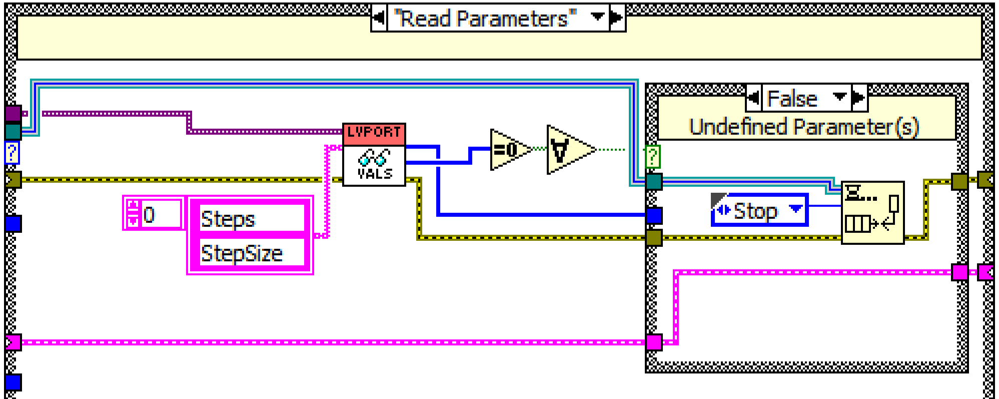
- **Start the IOC from LabVIEW**
  - – IOC built as a shared library
  - – Some changes to the main program allow access to the IOC shell.
    - Allocate a console for windows
    - Uses freopen for std I/O to connect to /dev/IOC before starting the iocshell.

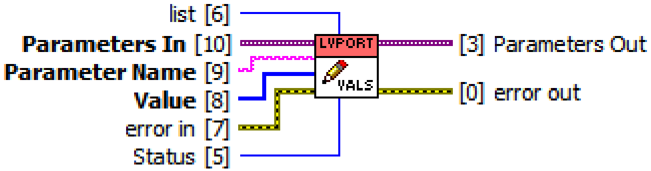




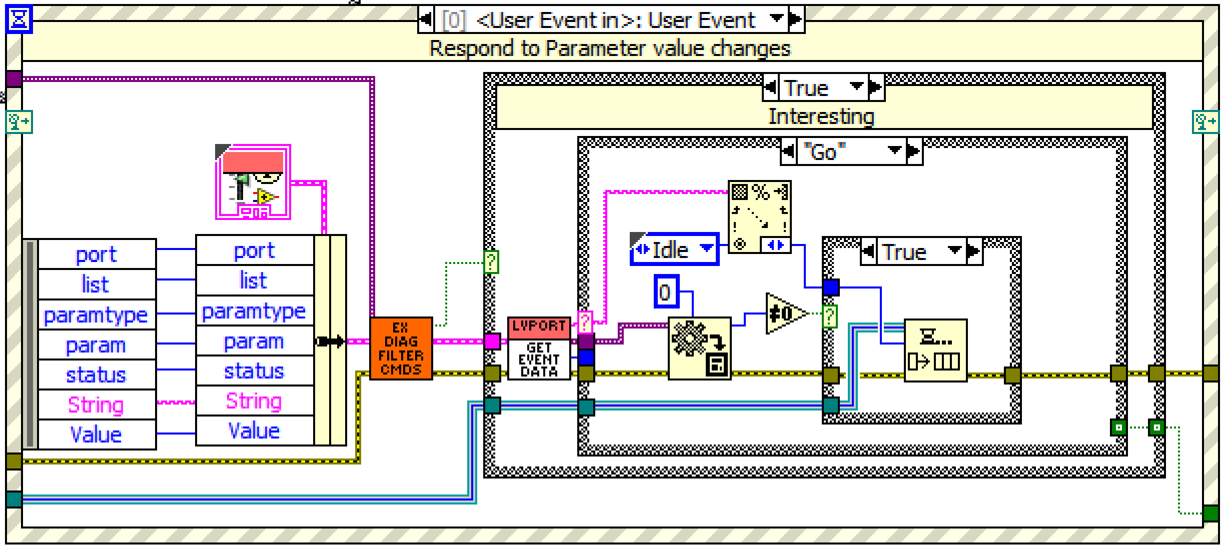
C:\epics\ioctop\bin\win32-x86-mingw\lvtest.dll
LVPORT
c:\epics\ioctop\iocBoot\ioc_lvtest\st.cmd
IOC's startup script

Using lvPortDriver (implementing device support)





- **Read**
- **Write**
  - Optional asynstatus (to indicate hardware limit, timeout, etc).
- **Respond to user events**



Where we will use this

- **Primarily for cRIO-based diagnostic systems.**
  - Our diagnostics team prefers to write in LabVIEW.
  - Programs frequently involve extensive calculations and logic implemented on the processor.
- **Someday perhaps on Linux RT (PXI)**
  - EPICS doesn’t currently run on Pharlap, and Linux RT is the future for PXI.

Where we will NOT use this

- **When a LabVIEW RT program is unnecessary.**
  - Our Industrial I/O code uses FPGA code and EPICS device support, the LabVIEW RT program only passed data between EPICS device support and the FPGA.
    - Logic is entirely within the FPGA or the EPICS database.
    - Configuration and scaling is in EPICS device support (C code).
  - I’ve modified the device support to use National Instrument’s C API for interfacing with the FPGA.

Accessing the IOC shell from Linux RT

- **Run IOC that connects stdio to /dev/IOC**
- **Create /dev/IOC**
  - socat -d -d pty,link=/dev/IOClink,raw,echo=0 pty,link=/dev/IOC,raw,mode=660,echo=0 &
- **From the Linux shell run socat - /dev/IOClink**
  - Could run this command via procserv if telnet access is desired.

Remaining Issues

- **Development environment for Windows Application can be difficult because there’s no good way to stop asyn Callback tasks once they are setup.**
  - This does not cause any problems for executable applications or for cross-platform development (where the shared libraries are not loaded).
  - Executables can call epicsExit, but in the development environment this also causes the development environment to close without warning.

Conclusion

- **A standard modern device support interface between EPICS and LabVIEW software.**
  - – Supports most asynPortDriver features.
    - Status
    - Parameter names/value/status reported by dbior.
  - – Could be extended to support additional features.
    - LabVIEW implementation of generic pointer.
    - Asynchronous processing could be done with event callbacks
  - – Will benefit from continued improvements in Asyn.
- **Implementation for a new program involves writing the LabVIEW program, and creating the EPICS database.**
  - – Not necessary to write matching C/C++ software, and keep them in synch.
  - – Easy to diagnose mismatched addresses.
- **lvPortDriver is available on github**
  - – https://github.com/sbaily/lvPortDriver