ICS ELECTRONICS
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APPLICATION BULLETIN

CONTROLLING AN ICS 8065 WITH TCL SCRIPT

INTRODUCTION

Tcl which stands for "Tool Command Language" is a simple textual programming language, intended for issuing commands to interactive programs such as text editors, debuggers and shells. It has a simple syntax and it is also programmable. Because of the popularity of Tcl in the Linux environment, users have asked for an example of how to use Tcl to control GPIB Instruments though an ICS 8065 Ethernet-to-GPIB Controller. The purpose of this application note is to provide a simple demo package and an outline for Tcl users on how to write a simple Tcl GPIB application using the 8065.

This Application Note assumes that the user has a working knowledge of Tcl. Refer to the Internet or to your computer documentation for additional information about Tcl or for information on its use.

THE DEMO SYSTEM

A simple demonstration system was put together which consisted of a PC with a Linux operating system, an ICS Model 8065 and a single GPIB device. An IEEE-488.2 compatible instrument was selected for the GPIB device was so that it would respond to the *IDN? query. Figure 1 shows the demo setup.
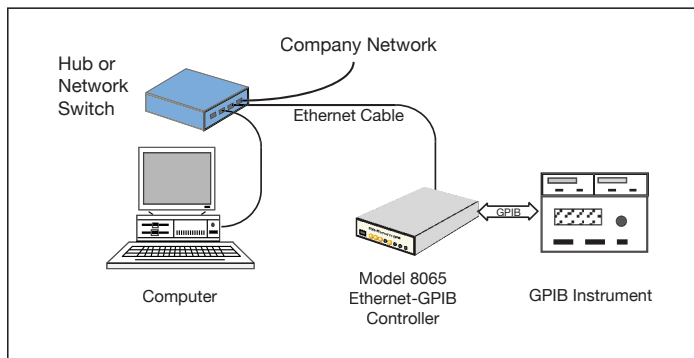

Figure 1 Demo System Block Diagram

THE DEMO PACKAGE

The TCL demo package consists of four files.

*   Makefile.dat
*   Vxi.c   (Library File)
*   Vxi11.x   (VXI-11 RPCL File)
*   Demo.tcl   (Demo Script File)

The makefile creates a vxi.so file which is combined with the demo.tcl file to provide VXI-11 (RPC) functionality. The actual VXI-11 function definitions are found in the vxi.c file which provides the interface to the RPC layer.

The demo.tcl file itself is very short and is shown below.

```
#!/usr/bin/tclsh
load vxi.so

Vxi_Open "192.168.1.77"  "gpib0"
Vxi_Ifc
Vxi_Close

Vxi_Open "192.168.1.77"  "gpib0,8"
Vxi_Clear
Vxi_Write "id?"
puts [Vxi_Read]
Vxi_Close
```

An examination of the demo.tcl file first shows a connection to the 8065 gateway at an ip address of '192.168.1.77' and the generation of an IFC signal to reset the GPIB bus. It then establishes a connection to the device at GPIB address 8, after which it sends an *IDN query and reads back the reply.

The Vxi_[function] calls are resolved in the vxi.c I/O library. Each of the functions must be defined at this layer, so as to establish RPC communication with the 8065.

Each function definition in the I/O library consists of three basic elements.

1. First the RPC VXI-11 command must be constructed. This consists of filling in RPC structure elements as required for the VXI-11 function to be performed.
2. The RPC VXI-11 command is then sent to the target RPC service (8065).
3. The RPC VXI-11 reply is then read from the target RPC service (8065).

The vxi.c file provided is a minimal demonstration program with only a few VXI-11 functions implemented. However it can be seen that adding additional VXI-11 functions would be relatively easy to accomplish. The existing vxi.c demo currently contains the following VXI-11 functions:

- Vxi_Init (create the TCL wrapper for the VXI-11 support library)
- Vxi_Open (establish an RPC connection and create a VXI-11 link)
- Vxi_Close (destroy a device link and close the RPC connection)
- Vxi_Ifc (issue an IFC pulse)
- Vxi_Clear (perform a device clear)
- Vxi_Read (read from a GPIB device)
- Vxi_Write (write to a GPIB device)

It should be noted that the sample vxi.c file is a minimalistic example with little provided in the way of error checking. A true I/O support library would need to provide additional error detection and error handling. This is true for both the incoming parameters as well as the RPC and VXI-11 communication.

APPLYING TCL TO VXI-11.3 INSTRUMENTS

This example is oriented to using Tcl to control an ICS 8065 which is a VXI-11.2 Gateway. The user can easily adapt the demo.tcl program to work with VXI-11.3 Instruments by changing the open commands to reference an "inst$n$" instead of "gpib0". (VXI-11.3 instruments are referred to as "inst" and have one or more personalities (designating channels or instrument functions) that start at inst0. An example is:

```
Vxi_Open "192.168.1.77"  "gpib0"
```

Becomes
```
Vxi_Open "192.168.1.77"  "inst0"
```

SUMMARY

This application note has provided a simple Tcl script program that uses VXI-11 RPC to control a GPIB instrument using an ICS 8065 Ethernet -to-GPIB Controller. Calls are made to the 8065 (GPIB Gateway) as well as to a GPIB instrument. All the files used in this example are included in the TCL.zip file which can be downloaded from ICS's website at http://www.icselect.com/.

The included library contains the 7 basic functions that will suffice for simple programs. The Vxi11.x file is the complete VXI-11 RPCL so a user with some C language experience can readily add additional VXI-11 functions to the library. The user is encouraged to add error detection and handling in a production program.

REFERENCES

The core development home for Tcl (Tool Command Language) at http://tcl.sourceforge.net/

Application-level Libraries and Test programs for Controls tds - simple interface to Tektronix TDS Oscilloscopes over VXI11 with tcl loadable commands at http://www-linac.kek.jp/cont/libinfo.html

Tcl From Wikipedia at http://en.wikipedia.org/wiki/Tcl