

# Instrument Communications in LabVIEW Using IVI Drivers

John Rudderham  
Vektrex  
September, 2002

## Agenda

- IVI
  - What is it? How do I use it? Is it contagious?
- Instruments with Ethernet Interfaces
  - How do I use them?
- Serial Communications
  - VISA vs Serial VIs, which to use?

## What is IVI?

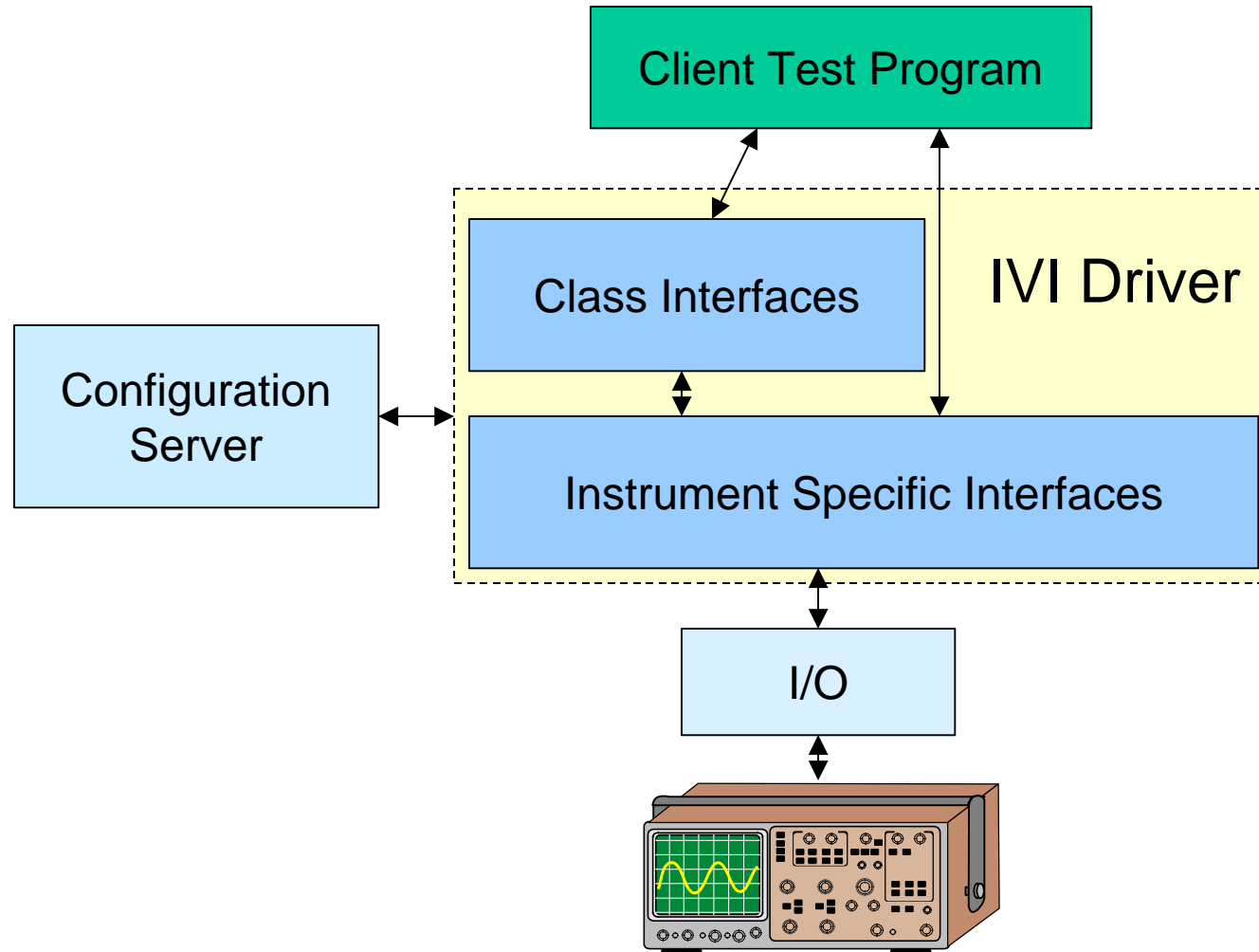
- Interchangeable Virtual Instruments
- Standards for Instrument Drivers
- Backed by the IVI Foundation – a group of instrument manufacturer, system integrators and end-users.
- The foundation's main task is to develop, approve and publish interchangeable instrument driver architecture and class definitions.
- IVI Drivers have other useful features:
  - State Caching
  - Simulation
- More information at [www.ivifoundation.org](http://www.ivifoundation.org)



## Approved Class Specifications

- Scope
- DMM
- Function Generator
- DC Power Supply
- Switch
- Power Meter
- Spectrum Analyzer
- RF Signal Generator

# IVI Driver Architecture



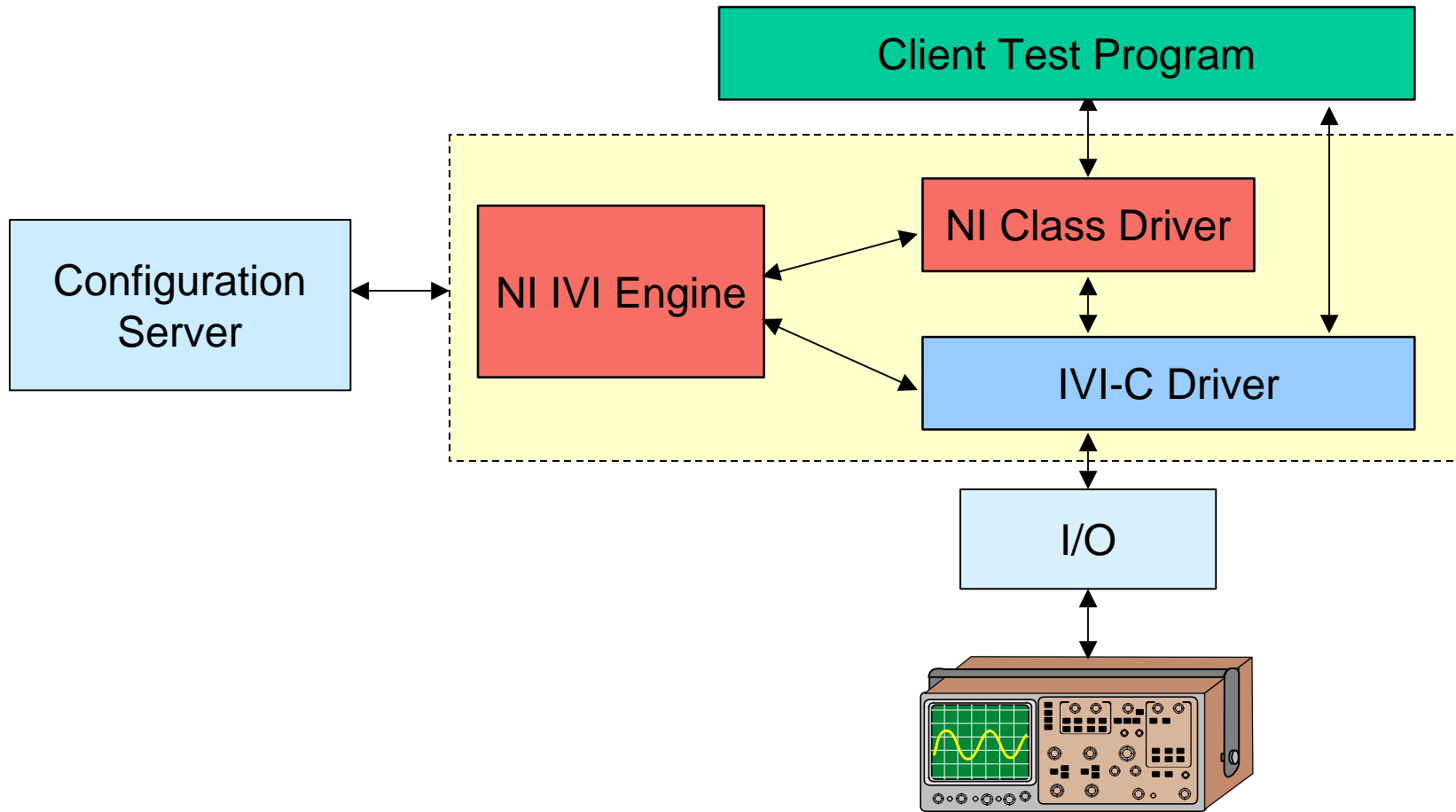
## Interchangeability 101

- Syntactic Interchangeability
  - API interchangeability
  - IVI class interfaces
  - IVI class drivers address true “syntactic” interchangeability
- Semantic Interchangeability
  - Behavioral interchangeability
  - Not always possible
  - MSS roles address semantic interchangeability
- Changing Form Factor
  - Standalone GPIB instrument to PXI for example
- True syntactic interchangeability addressed only through IVI class interface

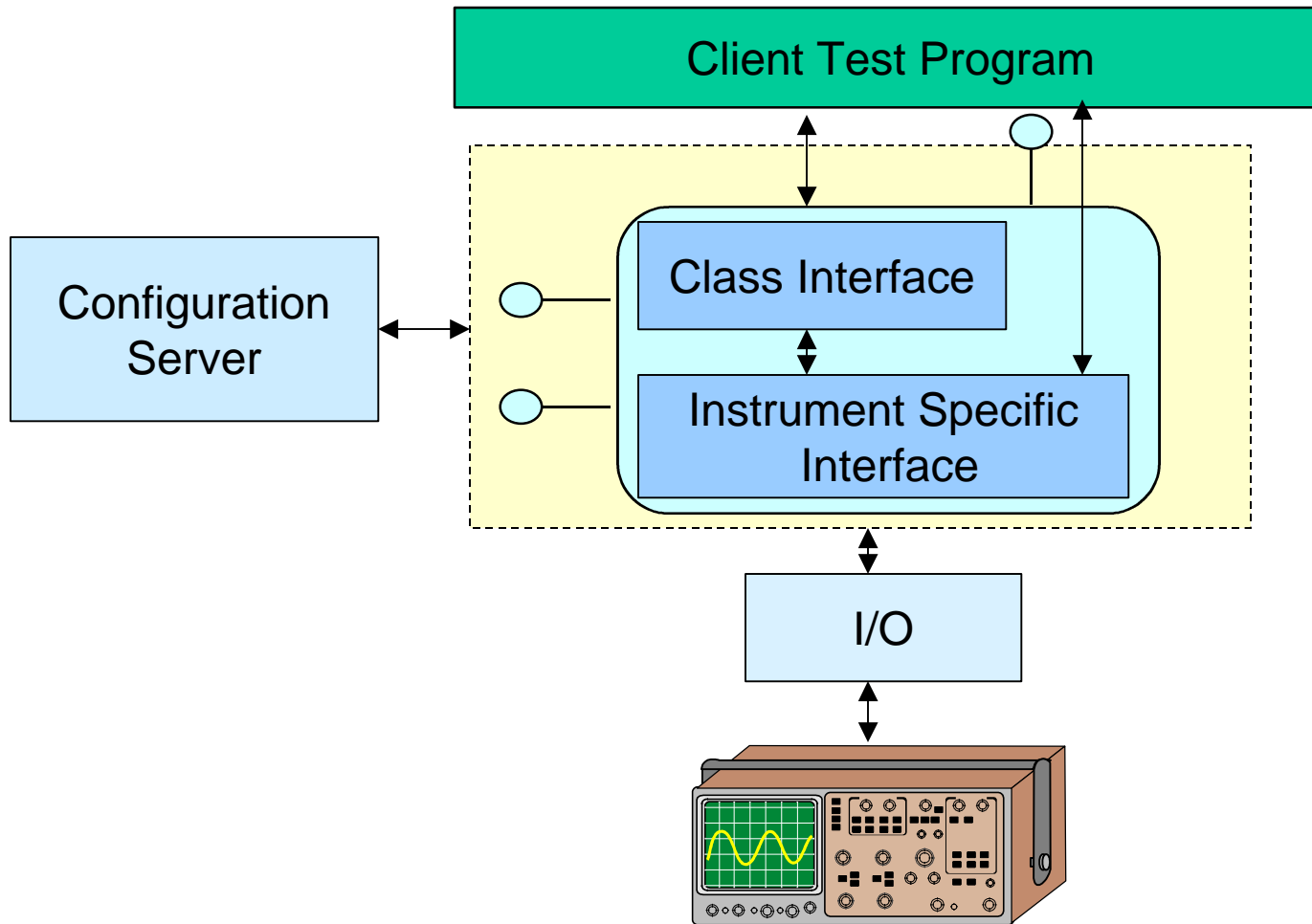
## IVI-C and IVI-COM

- The IVI foundation supports two types of IVI driver.
  - IVI C drivers are written in ANSI C and are distributed as win32 dynamic link library (dll).
  - IVI COM drivers are COM objects.
- Some differences for the end-user
  - IVI C class and instrument specific interfaces are in separate dlls, but all IVI COM interfaces are in the same dll.
- Good news is that both flavours work well from LabVIEW!

## IVI-C Driver Architecture

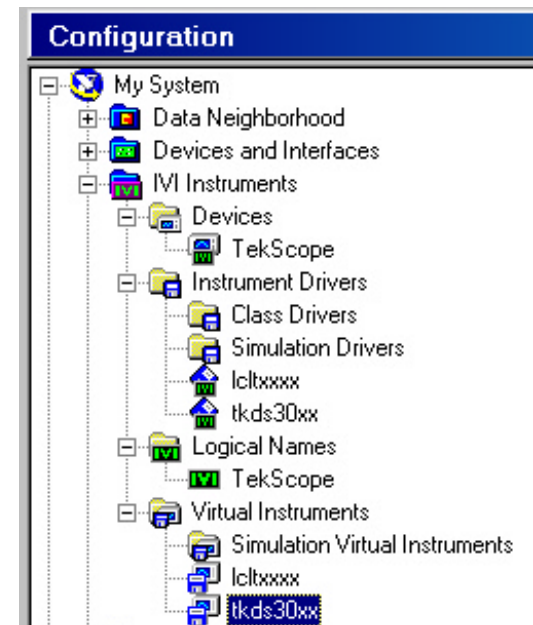
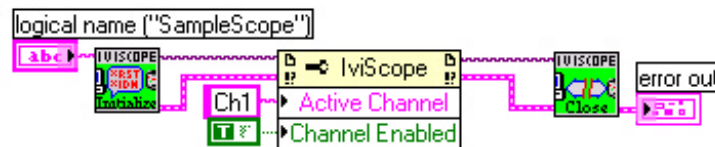


## IVI-COM Driver Architecture



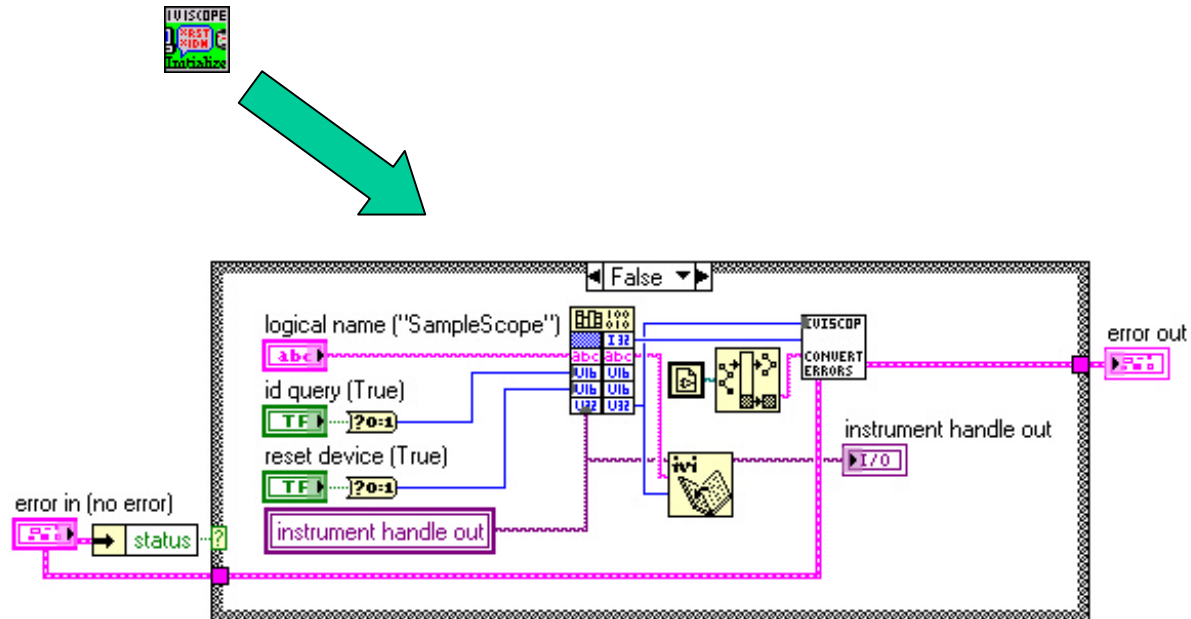
## Using IVI-C

- Configuration in measurement and automation explorer
  - Links between logical names, instruments and drivers. This is the only place where changes occur when an instrument changes.
- Use NI's class drivers
  - in the instrument I/O palette



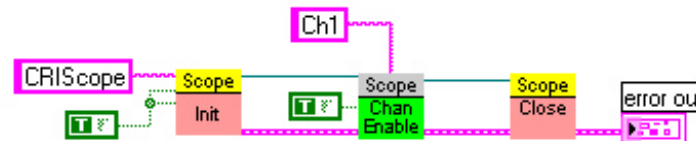
## Inside the IVI-C VIs

- IVI-C wrapper VIs contain calls to the driver dlls.



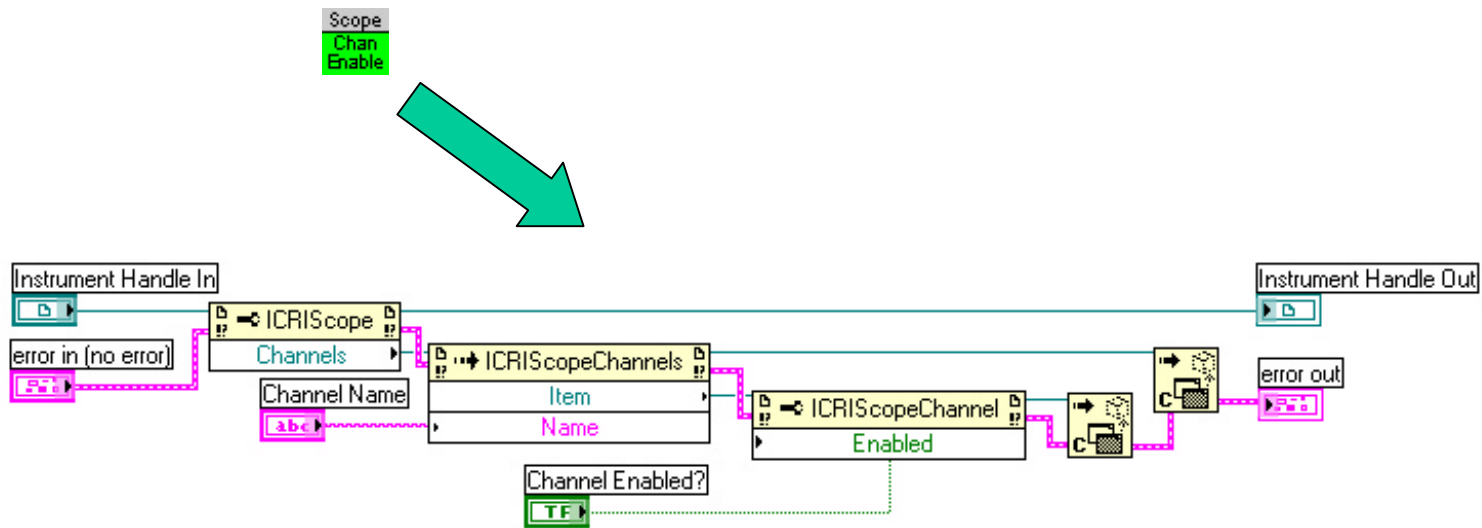
## Using IVI-COM

- Configuration information is stored in an XML file.
- This example uses the instrument specific interfaces, but still makes use of information in the configuration store.
- If available, utilize LabVIEW wrappers for the driver.
  - Vektrex's VIVID driver development suite can generate these wrappers.
  - in the instrument I/O palette



## Inside the IVI-COM VIs

- Driver functions are accessed just like you would access any ActiveX object.

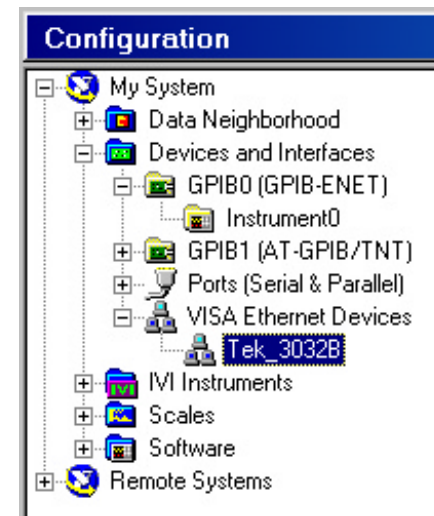


## Demo

- Talking to a scope using IVI drivers.....

## VISA and Ethernet

- In VISA version 2.5 support was added for communicating with instruments over Ethernet.
- Instruments are added to a new section in MAX...
- Once configured applications using VISA can switch between interfaces by just changing the VISA resource.
- All sorts of distributed application possibilities!



## Configuring a VISA Ethernet Device

- There are two protocols supported by VISA, sockets and VXI-11.
- VXI-11 is authored by the VXIbus Consortium, Inc. and sponsored by instrument manufacturers like Agilent and Tektronix.
- The socket protocol uses a VISA resource descriptor in the form TCPIP::10.0.0.150::7::SOCKET.
- VXI-11 uses VISA resource descriptors like TCPIP::10.0.0.150::INSTR.
- Pick the one your instrument supports! (Fortunately there is a test button in the configuration wizard...)

# MAX Configuration Screens

Create New...

## Measurement & Automation Explorer

Enter the TCP/IP address of your VISA network resource in the form of xxx.xxx.xxx.xxx, the name of the computer, or a computer@some.domain

Choose the type of TCP/IP resource you'd like to create:


Raw Socket  
 Port Number

VXI-11 Instrument  
 LAN Device Name

Try connecting to this resource:

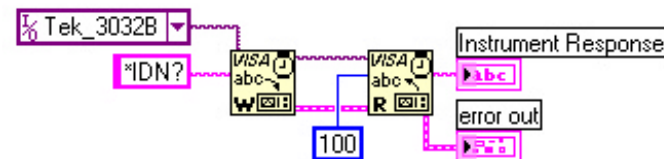
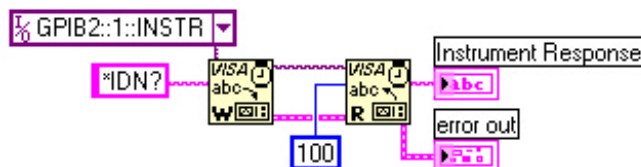
< Back   Next >   Finish   Cancel

MAX

 Successfully opened a VISA session to "TCPIP::10.0.0.150::INSTR"

## Usage

- To change between two interfaces using VISA (GPIB and Ethernet for example), just change the VISA resource name and run....
- Below, on the left is an instrument query using GPIB. On the right is the same query using Ethernet.



## Demo

- Show both GPIB and Ethernet retrieving trace from a Tektronix scope.

## Using a Serial Interface from LabVIEW

- Whether to use VISA calls or the old serial VIs is a much discussed topic.
  - See info LabVIEW archives! ([www.info-labview.org](http://www.info-labview.org)).
- We prefer VISA because
  - You get a consistent way to program all your I/O (GPIB, Serial, PXI, VXI, Ethernet.....)
  - Easy to use.
  - Supported by NI and instrument manufacturers and NI – good future-proofing.
- With modern versions of VISA there is no performance hit.
- Is there a time to use the Serial VIs?
  - If it is important to distribute a small exe – using VISA requires VISA to be installed. Serial VIs just use serdrv.dll (~25kB).