Calibrating a UUT on a Remote Computer Using Fluke MET/CAL®

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"ACHIEVING COMPETITIVE ADVANTAGE THROUGH MEASUREMENT INNOVATION"

INTRODUCTION

- Current and next generation test equipment presents challenge for calibration labs
- Technologies can be designed to work together
- Fluke MET/CAL® procedure and Metrology.NET
  - Basic design patterns of remote computing
  - Command interface for non-message based instrument
  - Remotely communicate with the instrument

THE PROBLEM

- Labs may not have resources to retool in order to support manufacturers' software solutions in maintaining PXI & PXIE instruments
- Customer required a solution to support National Instruments PXI-5122.
- Manufacturer solution required a Fluke 9500, but customer can't justify purchase.

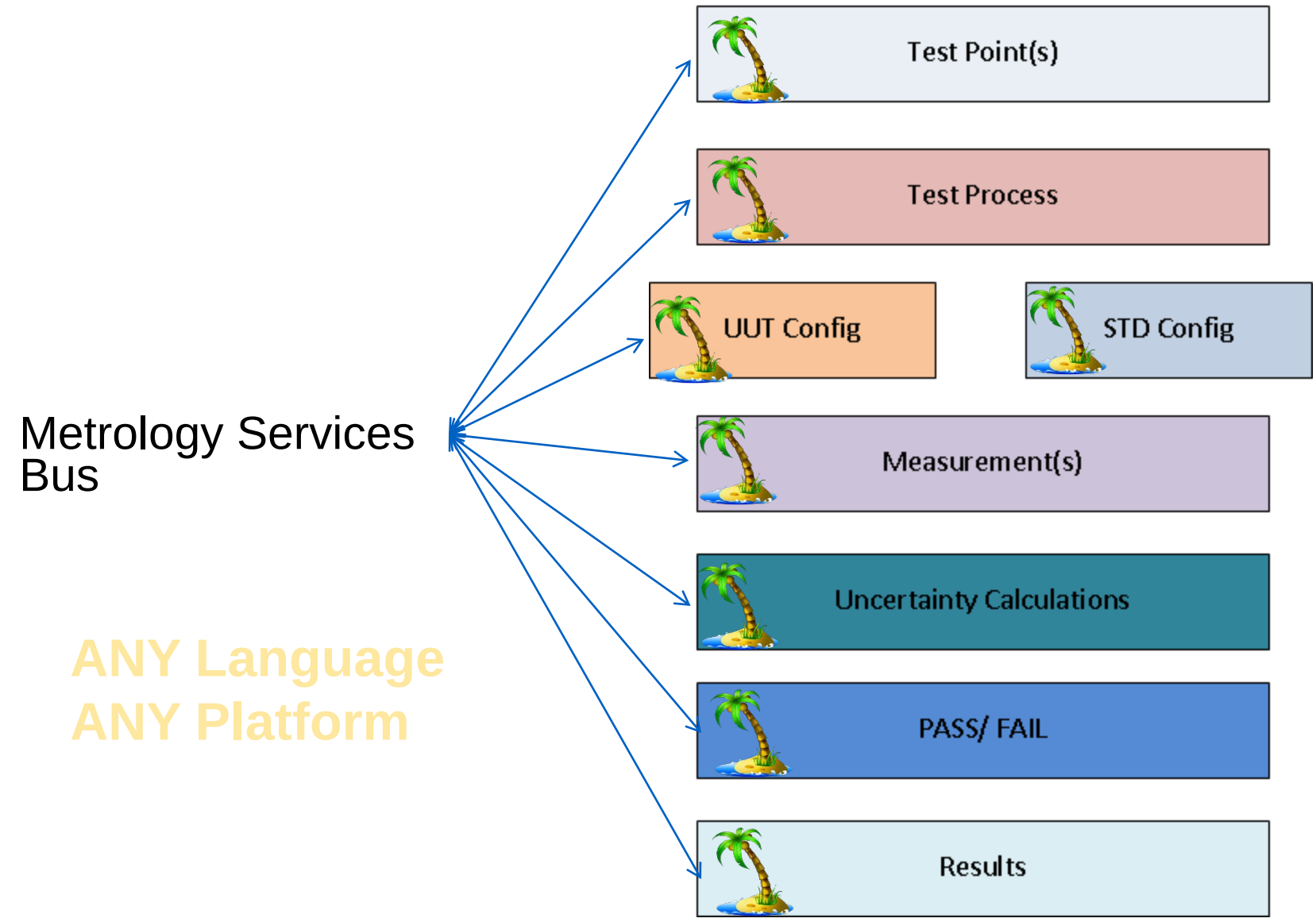
THE PROBLEM DOMAIN

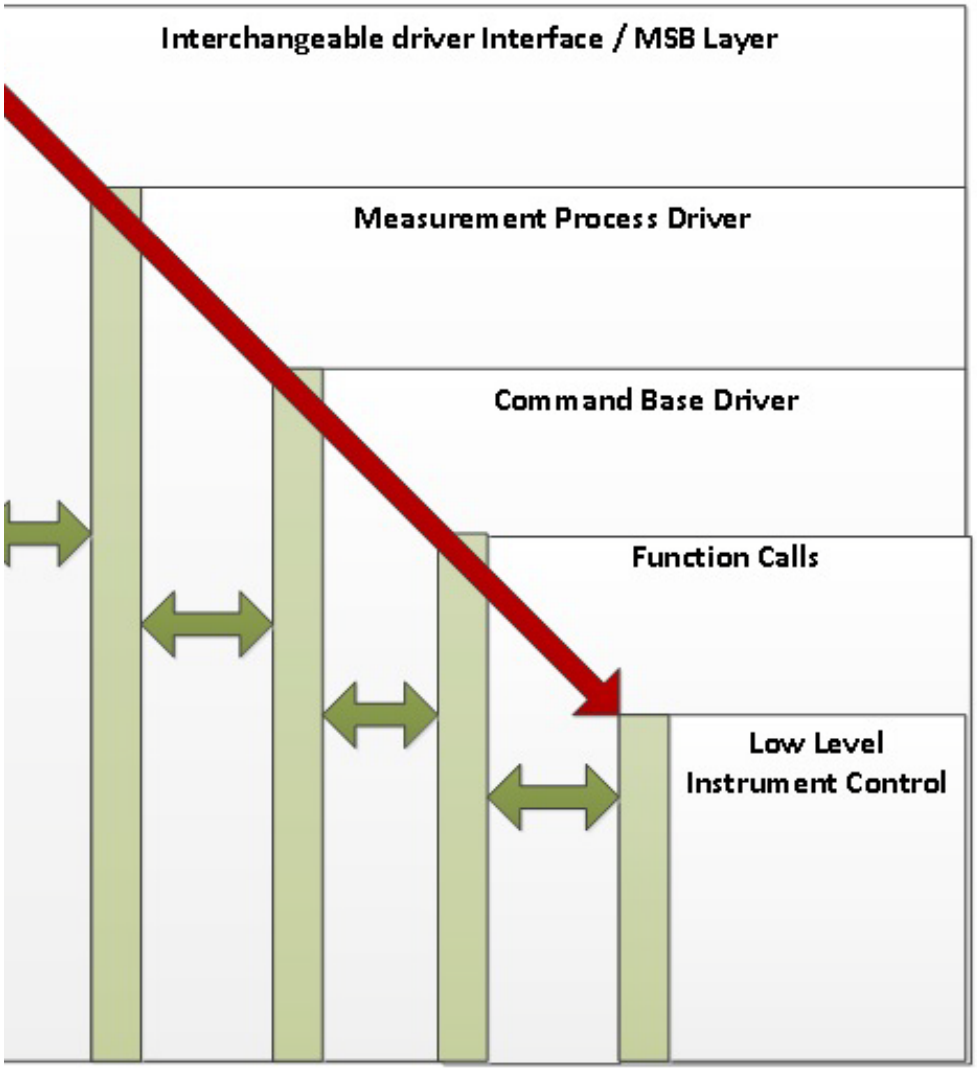
- The calibration lab needs a way to support the PXI-5122 in-house
- They do not have a Fluke 9500
- They have a Fluke 5520
- Testing them manually is not an option

OUR SOLUTION

- Starting point is with Fluke MET/CAL ®
- Software based instruments do not always run on every operating system
- Life expectancy
- Decouple the UUT code from the standard’s code
  - Text command interface for the UUT
  - Create a service
  - Create a client messaging app
  - Write the procedure and test

Its about Decoupling





CLS Software Layers

- **Metrology Service Bus Layer**
  - Language agnostic & platform independent
- **Measurement Process Driver**
  - Any language
  - Focus is quality measurement
- **Command Base Driver**
  - Not all instruments are command based
  - IEEE SCPI calls and RS-232 programming
- **Function Calls**
- **Low Level Instrument Control**

Creating a Command Set

Command	Function Call
IDN:	
Reset:	**niScope_init**
SelfCal:	
SelfTest:	
ConfigureChanCharacteristics: **Channel=** **,Impedance=** **,Bandwidth=**	**niScope_ConfigureChanCharacteristics**
ConfigureVertical: **Channel=** **,Coupling=** **,Attenuation=** **,Range=** **,Offset=**	**niScope_ConfigureVertical**
ConfigureHorizontalTiming: **SampleRate=** **,Position=** **,Points=**	**niScope_ConfigureHorizontalTiming**
ConfigureEdgeTrigger: **Channel=** **,Slope=** **,Coupling=** **,Level=**	**niScope_ConfigureTrigger**
ConfigureImmediateTrigger:	**niScope_Initiate**
Commit:	**niScope_Commit**
Measure: **Channel=** **,NumberOfAverages=** **,Measurement=**	**niScope_Fetch**

More often, newer software based instruments do not support a command based language

Function calls

Command processor

- Define the command language and write a string parser

<Command>:[<Name>= <Value>] [,<Name>= <Value>]

Example

ConfigureVertical: Channel= 1, Coupling= DC, Attenuation= 0, Range= 10, Offset= 0

Creating a Command Processor

```
Public Overrides Function Command(ByVal CMD As String) As String

    If UCase(CMD).Contains("IDN:".ToUpper) Then
       Return myScope.Identity.InstrumentModel
       Exit Function
    End If

    If UCase(CMD).Contains("Reset:".ToUpper) Then
       If Me.Reset() = 0 Then
          Return "Success"
       Else
          Return "ERROR!"
       End If
       Exit Function
    End If


    If UCase(CMD).Contains("ConfigureChanCharacteristics:".ToUpper) Then
       If Me.ConfigureChanCharacteristics(CMD) = 0 Then
          Return "Done"
       Else
          Return "ERROR!"
       End If
    End If
```

Exposing the Command Processor

Overrides in the function call

```
Public Overrides Function Command(ByVal CMD As String) As String
```

Operating Contract and WebGet

```
<OperationContract()>
    <WebGet(ResponseFormat:=WebMessageFormat.Xml,
    BodyStyle:=WebMessageBodyStyle.Bare)>
    Public MustOverride Function Command(ByVal CMD As String) As String
```

Creating a web interface

```
' Create New host
    Dim host = New WebServiceHost(handler, New Uri("http://" & Me.IP & ":" & Me.Port))
    Dim EP = host.AddServiceEndpoint(GetType(iTxtCommand), New WebHttpBinding(), Name)
    host.Open()
```

CREATING THE MCNETCOMM.EXE

- Next step: link to MET/CAL ®
- McNetComm.exe
  - Supports MET/CAL ® versions 5.0 – 8.x
  - COM visible

The MET/CAL ® Procedure

Calling the Default Test Configuration resetting the global variables:

```
3.001  LABEL       Default
# Channel Settings
3.002  MATH        @Channel    = 1
3.003  MATH        @Impedance  = 1e6
3.004  MATH        @Bandwidth  = 100e6
3.005  MATH        @Coupl      = "'DC'"
3.006  MATH        @Atten      = 1
3.007  MATH        @Range      = 4
3.008  MATH        @Offset     = 0
3.016  MATH        @AVG        = 8
# Horizontal Settings
3.009  MATH        @SampleRate = 10e6
3.010  MATH        @Position   = 50
3.011  MATH        @Points     = 100e3
#Trigger Settings
3.012  MATH        @TChannel   = 1
3.013  MATH        @Slope      = "'POS'"
3.014  MATH        @TCoupl     = "'DC'"
3.015  MATH        @Level      = 0.00125
```

With each test group we would set the Test Channel:

```
3.002  MATH        @Channel    = <Test Channel>
```

And every point we set the required variables and execute the test:

```
#------------------------------
10.005  MATH        @Volts=0.09*1
10.006  MATH        @Range=0.2*1
10.007  VSET        UUT_Res = .001
10.008  IF          Find(S[23],"EnableRepeatability",1)>0
10.009  VSET        U3 = 0
10.010  ENDIF
10.011  CALL        NI 51xx Sub Test Routines-Conf
10.012  MATH        L[9]=Fld(S[31],2,"Unc=")/1
10.013  ACC         0.000%_       L9U
10.014  IF          1==0
10.015  TARGET      -m
10.016  CALL        NI 51xx Sub Test Routines-Meas
10.017  ENDIF
10.018  MATH        MEM=Fld(S[31],2,"Value=")/1
10.019  MEMCX  0.2   %_           0.65U
```

The test routines would configure the UUT using the following Sub Tools Calls:

```
# Set up the Channel
3.023  MATH        S[30]="ConfChanChar"
3.024  CALL        NI 51xx Sub Tools
3.025  MATH        S[30]="ConfVert"
3.026  CALL        NI 51xx Sub Tools
```

The Sub Tools then passes the commands to the UUT as follows:

```
#================================================
7.001  LABEL       ConfChanChar
7.002  MATH        MEM2 = "ConfigureChanCharacteristics:"
7.003  MATH        MEM2=MEM2& " Channel= " & @Channel
7.004  MATH        MEM2=MEM2& ",Impedance= " &
@Impedance
7.005  MATH        MEM2=MEM2& ",Bandwidth=" &
@Bandwidth
7.006  DOS         C:\CLS\McNetComm.exe Query UUT

7.007  IF          Find(MEM2,"Configure",1)
7.008  DISP        Communication Error Command Not
Executed
7.009  ENDIF
7.010  END
#================================================
8.001  LABEL       ConfVert
8.002  MATH        MEM2 = "ConfigureVertical: "
8.003  MATH        MEM2=MEM2& " Channel=" & @Channel
8.004  MATH        MEM2=MEM2& ",Coupling=" & @Coupl
8.005  MATH        MEM2=MEM2& ",Attenuation=" & @Atten
8.006  MATH        MEM2=MEM2& ",Range= " & @Range
8.007  MATH        MEM2=MEM2& ",Offset= " & @Offset
8.008  DOS         C:\CLS\McNetComm.exe Query UUT

8.009  IF          Find(MEM2,"Configure",1)
8.010  DISP        Communication Error Command Not
Executed
8.011  ENDIF
8.012  END
```

CONCLUSION

- Why do all this work?
  - The software is now Decoupled
  - You can Cal the UUT in the Mainframe
  - You don’t have to reboot your workstation every time you change a UUT card.
  - BECAUSE IT’s COOL

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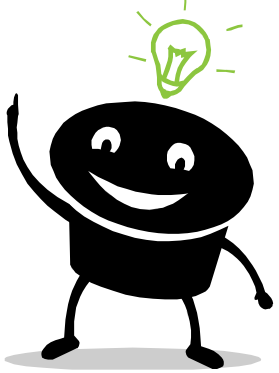
Questions? / Comments



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