

Application Note

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Using Aeroflex PXI DLL's with Embarcadero® C++ Builder

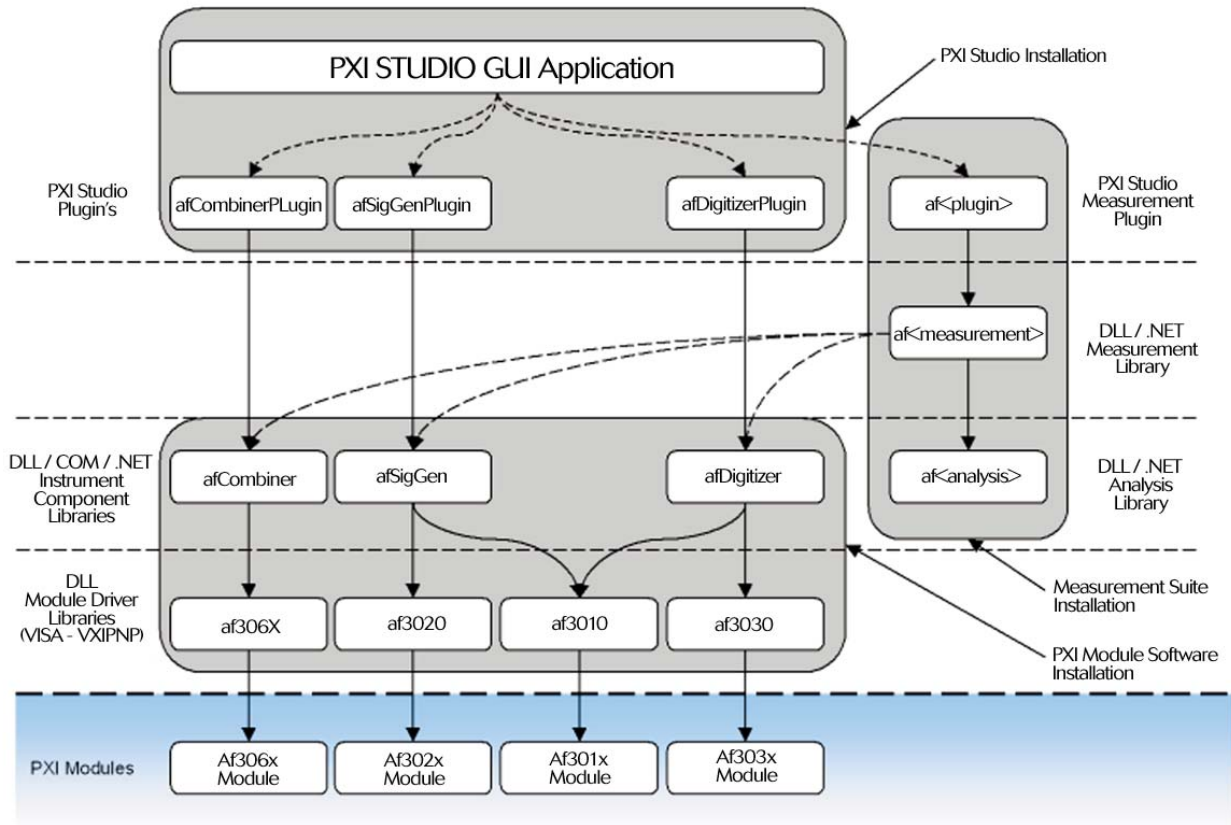


The Aeroflex PXI 3000 software architecture relies on dll interfaces to maximize speed of testing. This application note provides a way to generate lib files compatible with Embarcadero C++ for programming the PXI analysis and measurement libraries under this environment.

The application note opens with an introduction to the PXI software architecture. Two methods are then presented to convert Microsoft® lib files to Embarcadero C++, namely `coff2omf` and `implib`.

PXI Software Architecture and User dlls

Aeroflex PXI is controlled through a collection of hierarchical software libraries. All Aeroflex libraries for the PXI system have DLL interfaces available. These can be identified in the software architecture diagram shown in Figure 1.



Aeroflex 3000 Series PXI Modules - Software Architecture Overview

Figure 1: PXI 3000 Software Architecture

Most test applications that are written using Aeroflex PXI hardware and software will tend to use either the Measurement libraries or alternatively, the Component (hardware control) and Analysis (measurement analysis) libraries.

Measurement libraries are hardware dependant high level libraries that perform user requested measurements. This type of library simplifies the use of all the modular software and hardware components by performing all of the actions required for the measurements using the most optimal settings and return the results. An alternative approach using the component and analysis libraries together provide extended control of the hardware and software interfaces at the cost of additional programming.

Only the DLL module driver libraries provide both the Microsoft® and Borland®.lib files. These correspond to the lower layer in Figure 1 made up of af306X, af3020, af3010, and af3030. The higher layer DLLs are only supplied with Microsoft .lib files. For this reason, Embarcadero® C++ users will need to convert the Microsoft .lib files that are provided into the appropriate file type.

Microsoft uses COFF (Common Object File Format) .lib files - this format was derived from UNIX® System V during development of Windows NT™. This file format was inherited from UNIX in order to facilitate code design that would support both Intel® processors and other vendors. On the other hand, Borland, and hence Embarcadero, uses OMF (Intel Object Module Format) which has a history that goes all the way back to MS-DOS.

The Aeroflex supplied .lib files can be found in the locations identified in Table 1.

DLL Interface	Default directory location	File type
Module Driver Libraries	C:\VXIPNP\WinNT\lib\bc	Borland (OMF)
Component Libraries	C:\VXIPNP\WinNT\lib\msc	Microsoft (COFF)
Analysis Libraries	C:\Program Files\Aeroflex\PXI\Library	Microsoft (COFF)
Measurement Libraries		

Table 1: Default directory locations for PXI .dll files

To convert the library files from Microsoft to Embarcadero C++ users can rely on two command-line utilities included with the C++ Builder that can be used to generate a suitable .lib file. To this end two options are provided:

Option 1: coff2omf

Option 2: implib

Following the procedures described for either of the command-line utilities will enable the use of Embarcadero C++ for pro-

gramming with the Aeroflex PXI software libraries. The difference between the two is that `coff2omf` takes Microsoft `.lib` files and converts them to import library files whereas the `implib` tool generates an import library directly from a Microsoft DLL.

Although the `coff2omf` is the preferred tool to use since it converts Aeroflex generated `.lib` files into Borland compatible versions the `implib` tool can be used achieving similar results. Therefore, both methods are presented leaving it up to the user to decide which is more suitable for their situation.

Option 1: Use 'coff2omf'

The `coff2omf` tool converts a COFF (Microsoft) import library to a corresponding OMF import library that can be used with C++ Builder.

```
C:\tmp>coff2omf
COFF to OMF Converter Version 1.2.0 Copyright <©> 1999-2009 Embarcadero Technologies, Inc.
All rights reserved.
Syntax: COFF2OMF [ options] InputFile OutputFile
-h, -? Display help
-q Quiet mode
-v Verbose mode
-r Remove <delete> output file if empty
-lib:xx Specify options for OMF import library generation:
ms - Allow entries that have MS C++ name mangling <default: no>
st - Normalize names instead of aliasing MS stdcall mangling
ca - Don't perform MS cdecl aliasing <default is to alias>

COFF2OMF will convert COFF import library file <InputFile>
to the corresponding OMF type import library file <OutputFile>

C:\tmp>_
```

Figure 2 shows the `coff2omf` command syntax. Please refer to the documentation supplied with C++ Builder for more details.

To initiate the conversion process, a separate directory for the new `.lib` files should be created and the `coff2omf` command run for each of the required `.lib` files. This is illustrated in Figure 3 along with a listing of the contents of the newly created directory, the new C++ Builder `.lib` files. In this example, a number of `.lib` files were converted to C++ Builder files.

```
C:\Program Files\Aeroflex\PXI\Library>mkdir bc

C:\Program Files\Aeroflex\PXI\Library>coff2omf afCombinerDll.lib bc\afCombinerDll.lib
COFF to OMF Converter Version 1.2.0 Copyright <©> 1999-2009 Embarcadero Technologies, Inc.
All rights reserved.

C:\Program Files\Aeroflex\PXI\Library>coff2omf afDigitizerDll.lib bc\afDigitizerDll.lib
COFF to OMF Converter Version 1.2.0 Copyright <©> 1999-2009 Embarcadero Technologies, Inc.
All rights reserved.

C:\Program Files\Aeroflex\PXI\Library>coff2omf afMeasureSpectrumDll.lib
bc\afMeasureSpectrumDll.lib
COFF to OMF Converter Version 1.2.0 Copyright <©> 1999-2009 Embarcadero Technologies, Inc.
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C:\Program Files\Aeroflex\PXI\Library>coff2omf afMeasureWlanDll.lib bc\afMeasureWlanDll.lib
COFF to OMF Converter Version 1.2.0 Copyright <©> 1999-2009 Embarcadero Technologies, Inc.
All rights reserved.

C:\Program Files\Aeroflex\PXI\Library>coff2omf afSigGenDll.lib bc\afSigGenDll.lib
COFF to OMF Converter Version 1.2.0 Copyright <©> 1999-2009 Embarcadero Technologies, Inc.
```

Figure 3: '`coff2omf`' conversion sequence for Aeroflex `.PXI` lib files

Option 2: Use 'implib'

The `implib` tool takes a DLL as input and generates a corresponding import library that can be used with C++ Builder. This is an alternative tool that generates a Borland compatible `.lib` file, based on information extracted from the DLL file.

```
C:\Program Files\Aeroflex\PXI\Library>implib

CodeGear Implib Version 3.2.0 Copyright <©> 1991-2009 CodeGear

Syntax: IMPLIB [ options] libname[.lib] [ @respfile ; srcname] [ srcname]
Options:
-a Add '_' alias for MS flavor cdecl functions
-aa Force the alias even if the function already starts with '_'
-c Case sensitive symbols
-f Force imports by name <with hints>
-w No Warnings

Respfile may contain a list of source files to process.
Wildcards are ok for .DLL and .DEF file names.

C:\Program Files\Aeroflex\PXI\Library>
```

Figure 4 shows the `implib` command syntax. Please refer to the documentation supplied with C++ Builder for more details.

To initiate the conversion process, a separate directory for the new `.lib` files should be created and the `implib` command run for each of the required `.lib` files. This is illustrated in Figure 5 along with a listing of the contents of the newly created directory, the new C++ Builder `.lib` files. In this example, three instrument component libraries were converted to C++ Builder files.

```
C:\Program Files\Aeroflex\PXI\Library>mkdir bc

C:\Program Files\Aeroflex\PXI\Library>implib bc\afCombinerDll.lib
\Windows\System32\afCombinerDll_32.dll

CodeGear Implib Version 3.2.0 Copyright <©> 1991-2009 CodeGear

C:\Program Files\Aeroflex\PXI\Library>implib bc\afDigitizerDll.lib
\Windows\System32\afDigitizerDll_32.dll

CodeGear Implib Version 3.2.0 Copyright <©> 1991-2009 CodeGear

C:\Program
Files\Aeroflex\PXI\Library>implib\bc\afSigGenDll.lib\Windows\System32\afSigGenDll_32.dll

CodeGear Implib Version 3.2.0 Copyright <©> 1991-2009 CodeGear

C:\Program Files\Aeroflex\PXI\Library>dir bc
Volume in drive C has no label.
Volume Serial Number is 8466-9B21
```

Figure 5: '`implib`' conversion sequence for Aeroflex `.PXI` lib files procedure for PXI

It is important to use the appropriate libraries for conversion when using `implib`. For component libraries, the following files must be used as the source¹:

- afCombinerDll_32.dll
- afDigitizerDll_32.dll
- afSigGenDll_32.dll

It is important to note that if any of the Aeroflex PXI software is updated and the new functions need to be accessed re-generation of the specific `.lib` files is necessary following the process described in this document.

¹ afCombinerDll.dll, afDigitizerDll.dll and afSigGenDll.dll are present only for backwards compatibility purposes.

Conclusions

Users of Embarcadero C++ are able to access the functionality provided by the Aeroflex library files by following the conversion procedures described in this document. Two options are available to achieve conversion from Microsoft library files provided as standard to C++ Builder library files. These options rely on the two command-line tools `coff2omf` and `implib`.

It is important to note that when updating Aeroflex PXI software, the libraries that were created through this process will not be automatically updated. The conversion process must be repeated each time the software is updated and access to the new functionality is required.

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