Systems Alliance

VPP-4.3.5:
VISA Shared Components

June 9, 2010

Revision 5.0

Systems Alliance

VPP-4.3.5 Revision History

This section is an overview of the VPP-4.3.5 specification revision history.

Revision 1.0, October 16, 2008

First draft of the VPP-4.3.5 specification, based on Section 6 of the VPP-4.3.4 specification. This specification covers all aspects of the VISA Shared Components binaries and installation.

Revision 5.0, June 9, 2010

Added USBTMC components to shared component specification.

NOTICE

VPP-4.3.4: *VISA Shared Components* is authored by the IVI Foundation member companies. For a vendor membership roster list, please visit the IVI Foundation web site at www.ivifoundation.org, or contact the IVI Foundation at 2515 Camino del Rio South, Suite 340, San Diego, CA 92108.

The IVI Foundation wants to receive your comments on this specification. You can contact the Foundation through email at ivilistserver@ivifoundation.org, through the web site at www.ivifoundation.org, or you can write to the IVI Foundation, 2515 Camino del Rio South, Suite 340, San Diego, CA 92108.

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Section 1: Introduction to the VXI*plug&play* Systems Alliance and the IVI Foundation

The VXI*plug&play* Systems Alliance was founded by members who shared a common commitment to end-user success with open, multivendor VXI systems. The alliance accomplished major improvements in ease of use by endorsing and implementing common standards and practices in both hardware and software, beyond the scope of the VXIbus specifications. The alliance used both formal and de facto standards to define complete system frameworks. These standard frameworks gave end-users "plug & play" interoperability at both the hardware and system software level.

The IVI Foundation is an organization whose members share a common commitment to test system developer success through open, powerful, instrument control technology. The IVI Foundation's primary purpose is to develop and promote specifications for programming test instruments that simplify interchangeability, provide better performance, and reduce the cost of program development and maintenance.

In 2002, the VXI*plug&play* Systems Alliance voted to become part of the IVI Foundation. In 2003, the VXI*plug&play* Systems Alliance formally merged into the IVI Foundation. The IVI Foundation has assumed control of the VXI*plug&play* specifications, and all ongoing work will be accomplished as part of the IVI Foundation.

All references to VXI*plug&play* Systems Alliance within this document, except contact information, are there to preserve consistency with the original set of specifications.

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Section 2: Overview of VISA Shared Components Specification

This VISA specification is a document authored by the VXI*plug&play* Systems Alliance. The technical work embodied in this document and the writing of this document was performed by the VISA Technical Working Group.

This section provides a complete overview of the *VISA Shared Components* specification, and gives readers general information that may be required to understand how to read, interpret, and implement individual aspects of this specification. This section is organized as follows:

- Objectives of this specification
- Audience for this specification
- Scope and organization of this specification
- Application of this specification
- References
- Definitions of terms and acronyms
- Conventions

2.1. Objectives of This Specification

The *VISA Shared Components* specification describes the deployment of a common set of VISA components for developing multi-vendor software programs, including instrument drivers. The VISA Shared Components include the VISA COM components and the VISA Plug-In Architecture components. The IVI Shared Components are available from the IVI Foundation in the form of standard installers that guarantee a consistent, reliable installation.

2.2. Audience for This Specification

The primary audience is I/O vendors who wish to implement and install VISA-compliant I/O software.

Secondary audiences include instrument driver developers—whether an instrument vendor, system integrator, or end user—who wishes to implement instrument driver software that is compliant with the VXI*plug&play* standards, and instrumentation end users and application programmers who wish to implement applications that utilize instrument drivers compliant with this specification.

2.3. Scope and Organization of This Specification

This specification is organized in sections, with each section discussing a particular aspect of the VISA model.

Section 1, *Introduction to the VXIplug&play Systems Alliance and the IVI Foundation*, explains the VXI*plug&play* Systems Alliance and its relation to the IVI Foundation.

Section 2, *Overview of VISA I/O Components and Installation Specification*, provides an overview of this specification, including the objectives, scope and organization, application, references, definition of terms and acronyms, and conventions.

Section 3, *VISA Shared Components*, provides an overview of the files and required infrastructure that make up the VISA Shared Components.

Section 4, *VISA Shared Components Installers*, discusses the implementation of the VISA Shared Components installers.

2.4. Application of This Specification

This specification describes standards to be used by developers of VISA and VISA COM I/O library software. After June 1, 2007 every release of a VISA I/O library must use installers provided by the IVI Foundation to install shared VISA components.

It is also useful as a reference for developers and end users of VISA I/O library software, as well as VXI*plug&play* and IVI instrument drivers.

2.5. References

The following documents contain information that you may find helpful as you read this document:

- VPP-1, VXI*plug&play Charter Document*
- VPP-2, *System Frameworks Specification*
- VPP-3.1, *Instrument Drivers Architecture and Design Specification*
- VPP-3.2, *Instrument Functional Body Specification*
- VPP-3.3, *Instrument Driver Interactive Developer Interface Specification*
- VPP-3.4, *Instrument Driver Programmatic Developer Interface Specification*
- VPP-4.1, *VISA-1 Main Specification*
- VPP-4.2, *The VISA Transition Library*
- VPP-4.3, *The VISA Library*
- VPP-4.3.2, *VISA Implementation Specification for Textual Languages*
- VPP-4.3.3, *VISA Implementation Specification for the G Language*
- VPP-4.3.4, *VISA Implementation Specification for COM*
- VPP-6, *Installation and Packaging Specification*
- VPP-7, *Soft Front Panel Specification*
- VPP-9, *Instrument Vendor Abbreviations*
- VXI-1, *VXIbus System Specification*, Revision 1.4, VXIbus Consortium
- VXI-11, *TCP/IP Instrument Protocol*, VXIbus Consortium

2.6. Definition of Terms and Acronyms

The following are some commonly used terms within this document

API	Application Programmers Interface. The direct interface that an end user sees when creating an application. The VISA API consists of the sum of all of the operations, attributes, and events of each of the VISA Resource Classes. The VISA COM I/O API consists of a collection of COM interfaces. The VISA COM .NET API consists of a collection of .NET interfaces and classes.
COM	**C**omponent **O**bject **M**odel, a Microsoft technology for reusable software components.
Component	A DLL or EXE that implements executable ANSII C, COM, or .NET code. Executable components may be accompanied by other supporting files, such as help files.
Instrument	A device that accepts some form of stimulus to perform a designated task, test, or measurement function. Two common forms of stimuli are message passing and register reads and writes. Other forms include triggering or varying forms of asynchronous control.
Instrument Driver	Library of functions for controlling a specific instrument.
VISA	Virtual Instrument Software Architecture. This is the general name given to this document and its associated architecture. The architecture consists of two main VISA components: the VISA Resource Manager and the VISA Instrument Control Resources.
VISA COM	VISA for COM. VISA COM is an architecture that provides VISA functionality via a COM API.
VISA Shared Components	A common set of VISA components for which there must be only one implementations. That implementation is provided by the IVI Foundation, and is described in this document.
WOW64	**W**indows **O**n **W**indows **64**, a Microsoft technology for allowing the execution of 32-bit native code programs on 64-bit operating systems.

2.7. Conventions

Throughout this specification you will see the following headings on certain paragraphs. These headings instill special meaning on these paragraphs.

Rules must be followed to ensure compatibility with the System Framework. A rule is characterized by the use of the words **SHALL** and **SHALL NOT** in bold upper case characters. These words are not used in this manner for any purpose other than stating rules.

Recommendations consist of advice to implementers that will affect the usability of the final device. They are included in this standard to draw attention to particular characteristics that the authors believe to be important to end user success.

Permissions are included to *authorize* specific implementations or uses of system components. A permission is characterized by the use of the word **MAY** in bold upper case characters. These permissions are granted to ensure specific System Framework components are well defined and can be tested for compatibility and interoperability.

Observations spell out implications of rules and bring attention to things that might otherwise be overlooked. They also give the rationale behind certain rules, so that the reader understands why the rule must be followed.

A Note on the text of the specification: Any text that appears without heading should be considered as description of the standard and how the architecture was intended to operate. The purpose of this text is to give the reader a deeper understanding of the intentions of the specification including the underlying model and specific required features. As such, the implementer of this standard should take great care to ensure that a particular implementation does not conflict with the text of the standard.

Section 3: VISA Shared Components

The VISA Shared Components are a common set of VISA components for developing multivendor software programs, including VISA I/O libraries and a variety of instrument drivers.

The components are “shared” because multiple VISA and VISA COM vendor-specific implementations must share a single copy of each component. Because there may only be a single copy of the component per PC, and the behavior of each component is precisely described, the IVI Foundation supplies a standard implementation of each of them; in fact, the IVI Foundation implementation of each shared component *must* be used wherever the component is called for.

The VISA Shared Components include the VXI*plug&play* infrastructure, VISA COM components, and VISA Plug-In Architecture components. The IVI Shared Components are available from the IVI Foundation in the form of standard installers that guarantee a consistent, reliable installation.

The VXIplug&play infrastructure includes the framework directory structure, registry entries, and environment variables. They are described in *VPP-2, System Frameworks Specification*.

The VISA Plug-In Architecture components include shared files that allow multiple vendor-specific VISA libraries to be installed on a single PC. In the past, the standard did not directly support this, as each vendor-specific VISA library had to install a file named *visa32.dll* in the system directory. To avoid potential backwards compatibility issues with older versions of VISA that follow this naming standard, the VISA Plug-In Architecture is available only on 64-bit PCs.

The VISA COM components include shared VISA COM functionality, including the VISA COM type library, the associated PIA, the Global Resource Manager, and Basic Formatted IO. These components are available for both 32-bit and 64-bit PCs. They are described in *VPP-4.3.4, VISA Implementation Specification for COM*.

3.1. VXI*plug&play* Infrastructure

The VXIplug&play infrastructure includes the directories, HKLM\SOFTWARE registry keys and values, and environment variables for each installed VXI*plug&play* framework.

The WinNT framework is installed on 32-bit Windows operating systems.

Both the WinNT and Win64 frameworks are installed on 64-bit Windows operation systems. On 64-bit operations systems, the WinNT framework is installed to the appropriate Windows On Windows 64 (WOW64) directories and registry keys.

3.2. VISA Plug-In Architecture Components

3.2.1. VISA Header Files

VISA header files are now included in the VISA shared component installers, because they are needed for VISA development.

The VISA header files are:

- `visa.h`
- `visatype.h`

See *VPP-4.3.2: VISA Implementation Specification for Textual Languages* for a description of these files. The content of each file is listed as an appendix to VPP-4.3.2.

Vendor-specific WIN64 framework VISA installers may not overwrite `visa.h` or `visatype.h`. Vendor-specific WINNT framework VISA installers may not overwrite `visatype.h`, but may overwrite `visa.h` to maintain backwards compatibility with previous vendor-specific versions of `visa.h`.

3.2.2. The VISA Router

The VISA Router is supported only on Vista 64.

The VISA Router component includes the following files:

- `visa64.dll`
- `visa64.lib`
- `visa64.def` (documentation only, not installed)
- `visaRouter.h`

The VISA Router implements entry points defined by the VISA API, but only so that it can call the corresponding entry points in vendor-specific implementations of VISA. VISA users call the VISA API through the VISA Router. The VISA Router routes calls to the appropriate vendor-specific VISA, and also handles callbacks from the vendor-specific VISA to the calling program. The VISA object handles used by the Visa Router are unique and different from the VISA object handles returned from the underlying vendor-specific VISA libraries. The VISA Router takes care of mapping its object handles to the handles used by each of the underlying VISA libraries.

For improved performance, when only a single vendor-specific VISA is installed, the VISA Router acts as a simple pass-through. The object handles returned to the user are those returned from the installed vendor-specific VISA.

Once a session is opened in the VISA Router, most of the VISA entry points simply map the VISA session handle passed into the call to the handle of the underlying vendor-specific VISA, call the underlying VISA, and return the results. There are a few entry points, however, where the process is more complicated because the router needs either to call more than one underlying VISA or determine which underlying VISA to call. The behavior of these entry points is documented in the following sections. In addition, `visaRouter.h` includes additional items needed by the Visa Router, also documented below.

In the entry points described below where calls are made to more than one of underlying VISA libraries, the order in which these calls are made is as follows:

1. The “preferred” VISA, if one is defined.
2. Each installed VISA in lexical order of the VISA GUID.

3.2.2.1. viOpenDefaultRM

The first viOpenDefaultRM call in a process gets a list of the vendor-specific VISA libraries that are installed and enabled. It loads each of these VISA libraries and returns a session handle to the user. Subsequent calls to viOpenDefaultRM use the list of open VISA libraries generated in the first call, but they return a new unique session handle to the user. When the last defaultRM session is closed, all of the vendor-specific VISA libraries are unloaded if the value of the VI_ATTR_UNLOAD_PLUGINS_IF_LAST_RM attribute is set to VI_TRUE.

3.2.2.2. viOpen

The viOpen call finds a vendor-specific VISA that can successfully parse and open the resource string passed in. Because it is possible that more than one vendor-specific VISA can open a resource, this function checks the enabled vendor-specific VISA libraries in the following order and returns with the first one that succeeds:

1. The VISA that the user chose to handle devices on the interface the resource string specifies.
2. The VISA that was last used to successfully open this resource.
3. The “preferred” VISA, if one was specified.
4. Each VISA in the list of installed VISA libraries that has not already been tried.

If none of the VISA libraries can parse the resource string, a VI_ERROR_RSRC_NFOUND error is returned. If at least one VISA can parse it, but none can open it, the error code from the first VISA to parse it is returned.

3.2.2.3. viFindRsrc/viFindNext

The following algorithm generates the list of resources returned:

1. Create an empty master list of resources to be returned.
2. Call viFindRsrc/viFindNext on each underlying VISA in turn, starting with the preferred VISA if there is one.
3. For each resource found:
   a. Remember the viFindRsrc/viFindNext name.
   b. Call viParseRsrcEx and remember the canonical name returned.
   c. Call the conflict manager and remember whether the resource is on a “chosen” interface. (There is no differentiation between user chosen and resource manager chosen.)
   d. Compare the canonical name with the canonical names already in the master list.
   e. If the canonical name does not exit in the master list, add the resource to the master list.
   f. If the current resource is on a chosen interface, replace the matching element in the master list with this one.
4. Return the names returned by the underlying viFindRsrc/viFindNext calls to the user.

3.2.2.4. viParseRsrc/viParseRsrcEx

viParseRsrc is called on each underlying VISA, and the result from the first VISA to succeed is returned. If none of the VISA libraries succeed, the status code returned by the first VISA called is returned.

viParseRsrcEx is called on each underlying VISA, and the result from the first VISA to succeed is returned. If none of the VISA libraries succeed, the status code returned by the first VISA called is returned.

3.2.2.5. viGetAttribute

The behavior of viGetAttribute depends on the type of object it is being called on.

For objects returned from viOpen or event objects, if the attribute being requested is a multivendor VISA attribute defined in `visaRouter.h` (VI_ATTR_UNDERLYING_VISA_SESSION, VI_ATTR_MULTI_MANF_NAME, VI_ATTR_MULTI_SPEC_VERSION, VI_ATTR_MULTI_MANF_ID, or VI_ATTR_MULTI_IMPL_VERSION), the appropriate result and/or status code is returned. For any other attribute, the viGetAttribute of the underlying VISA is called and the result is returned.

For objects returned from viOpenDefaultRM or viFindRsrc, if the attribute being requested is defined in `visaRouter.h` as above, the appropriate result and/or status code is returned. This algorithm also applies for the attribute VI_ATTR_UNLOAD_PLUGINS_IF_LAST_RM for sessions returned by viOpenDefaultRM. Otherwise, viGetAttribute is called on each underlying VISA, and the results are retuned from the first VISA to succeed. If none of the VISA calls succeed, VI_ERROR_NSUP_ATTR is returned.

3.2.2.6. viSetAttribute

The behavior of viSetAttribute depends on the type of object it is being called on.

For objects returned from viOpen or event objects, if the attribute being set is a multivendor VISA attribute defined in `visaRouter.h` (VI_ATTR_UNDERLYING_VISA_SESSION, VI_ATTR_MULTI_MANF_NAME, VI_ATTR_MULTI_SPEC_VERSION, VI_ATTR_MULTI_MANF_ID, or VI_ATTR_MULTI_IMPL_VERSION), the appropriate result and/or status code is returned. For any other attribute, the viSetAttribute of the underlying VISA is called and the result is returned.

For objects returned from viOpenDefaultRM or viFindRsrc, if the attribute being set is defined in `visaRouter.h` as above, the appropriate result and/or status code is returned. Otherwise, the attribute is set on each underlying VISA. If one or more of the underlying VISA libraries returns a status value greater or equal to VI_SUCCESS, the status returned to the user is the status returned by the first underlying VISA that returned a successful status code. If none of the underlying VISA libraries return a successful status code, the unsuccessful status code of the first underlying VISA called is returned.

For viSetAttribute, the VI_ATTR_UNLOAD_PLUGINS_IF_LAST_RM attribute (which applies only to viOpenDefaultRM) is handled differently. The state of the attribute is saved in the VISA Router, and each of the underlying VISA libraries is called with this attribute as well, and the status returned from the underlying VISA libraries is ignored. The status returned to the user will be VI_SUCCESS.

3.2.2.7. visaRouter.h Additions

`visaRouter.h` defines the following router-specific attributes:

Symbolic Name	Access Privilege		Data Type	Default Value
VI_ATTR_UNDERLYING_VISA_SESSION	RO	Local	ViSession	N/A
VI_ATTR_MULTI_SPEC_VERSION	RO	Global	ViVersion	N/A
VI_ATTR_MULTI_MANF_NAME	RO	Global	ViString	IVI Foundation
VI_ATTR_MULTI_MANF_ID	RO	Global	ViUInt16	0x3FFF
VI_ATTR_MULTI_IMPL_VERSION	RO	Global	ViVersion	N/A
VI_ATTR_UNLOAD_PLUGINS_IF_LAST_RM	RW	Global	ViBoolean	VI_FALSE

3.2.3. The Conflict Resolution Manager

The Conflict Resolution Manager is supported on both the WINNT and WIN64 frameworks.

In cases where more than one vendor-specific VISA library can connect to an interface, the conflict resolution manager provides information regarding available vendor-specific VISA libraries and user preferences.

RULE 3.2.1

VISA vendors **SHALL** use the IVI Foundation implementation of the conflict resolution manager and **SHALL NOT** create or use a vendor-specific version.

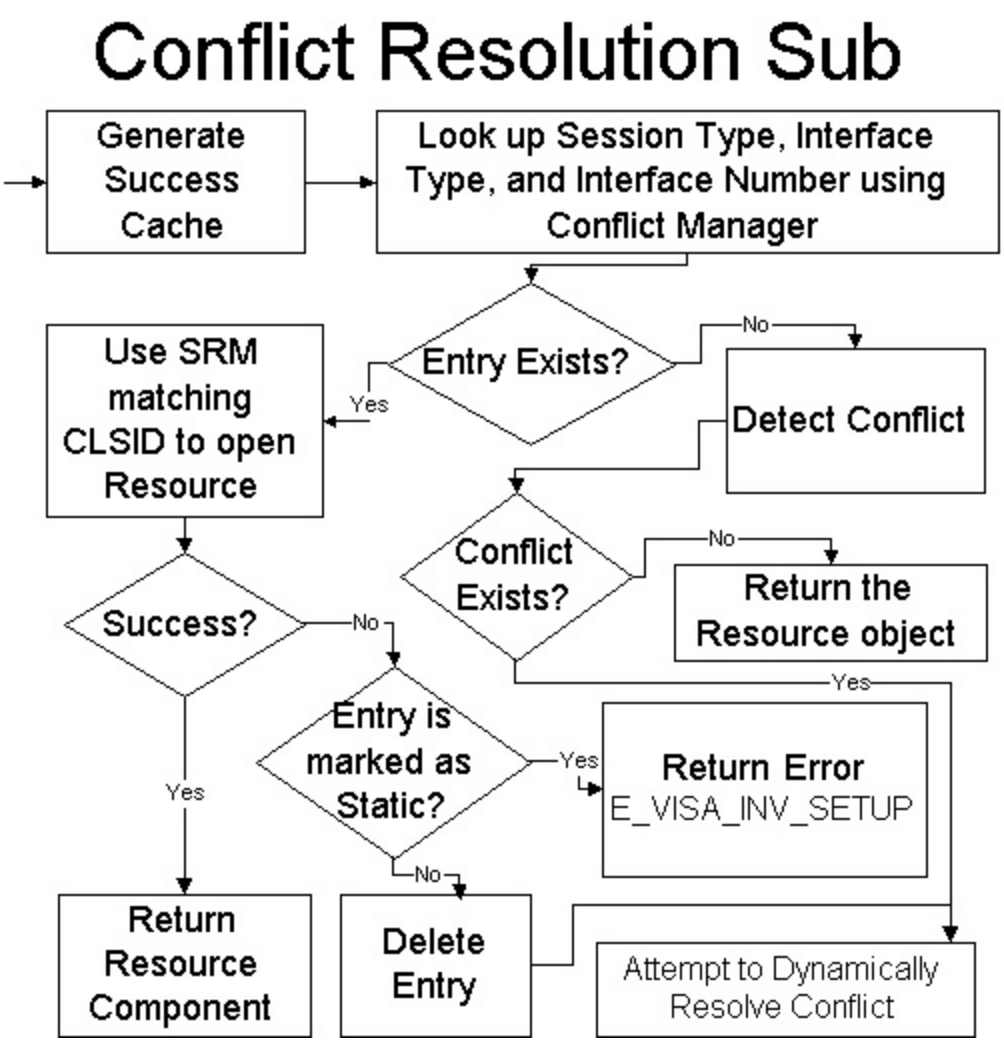
OBSERVATION 3.1.1

VISA vendors may want to include various capabilities for manipulating the VISA conflict resolution process using the Conflict Resolution Manager. The purpose of describing the API details of the Conflict Resolution Manager in this document is to document it so that vendors can use it correctly.

3.2.3.1. How Conflict Resolution Works

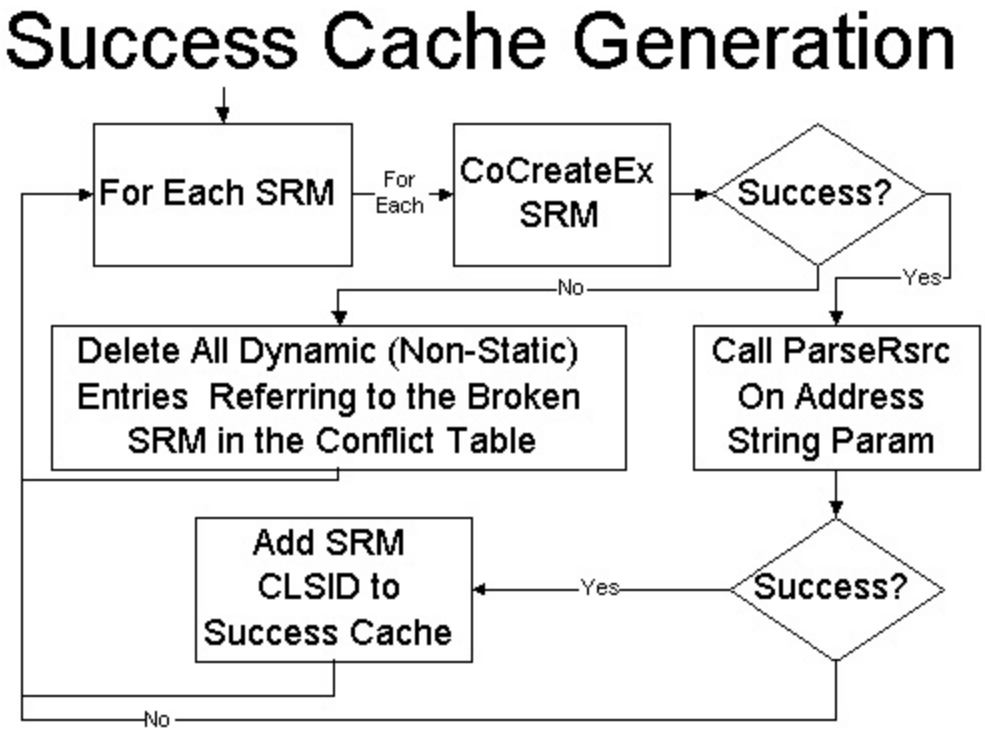
Conflict Resolution

When multiple VISA libraries are present on a system, some method of determining which VISA library shall be used is required. The Conflict Resolution Manager follows the algorithm outlined below to provide information regarding available vendor-specific VISA libraries and user preferences. The algorithm takes into account previous results in combination with user-defined preferences. The algorithms in this section use the information the conflict resolution manager provides, but the implementation of these algorithms is in the VISA Router and the VISA-COM Global Resource Manager. (The diagrams reflect COM details at points, but the general logic applies to both.)


Conflict Resolution Sub
Generate Success Cache
Look up Session Type, Interface Type, and Interface Number using Conflict Manager
Entry Exists?
No
Yes
Use SRM matching CLSID to open Resource
Detect Conflict
Conflict Exists?
No
Return the Resource object
Success?
No
Yes
Entry is marked as Static?
Yes
Return Error E_VISA_INV_SETUP
Yes
No
Return Resource Component
Delete Entry
Attempt to Dynamically Resolve Conflict

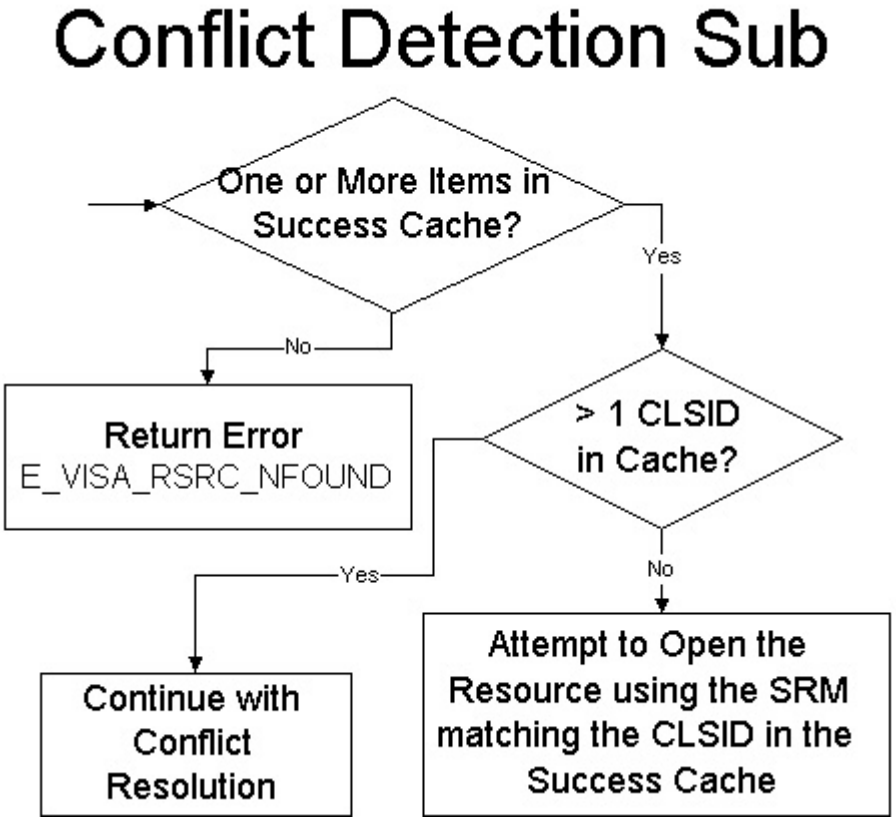
Success Cache Generation

A portion of the conflict resolution algorithm requires a listing of which VISA libraries previously opened the desired resource. This listing is known to the VISA Conflict Resolution Manager as the success cache, and it is generated using the algorithm below.



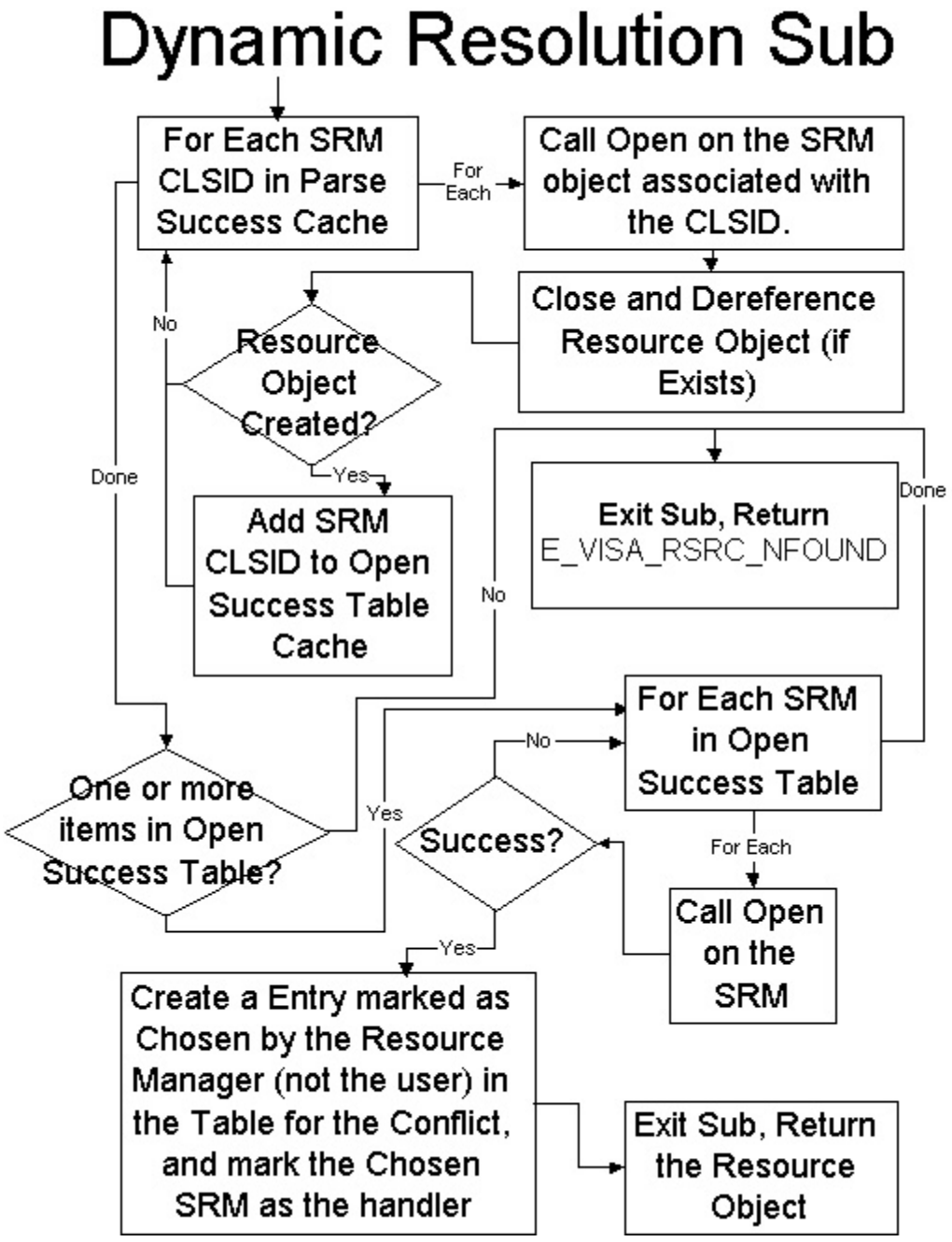
Conflict Detection

The conflict detection subroutine outlined below is used when determining which VISA library to use for a specified resource. The goal of this subroutine is to determine whether any libraries can open the given resource and ensuring that the VISA library used previously to open that resource is used.



Dynamic Resolution

The Dynamic Resolution Subroutine is used when the resource has not been previously opened or if the VISA library previously used has failed. This subroutine finds a VISA library that can open the resource if one exists, and note that entry in the settings cache.



3.2.3.2. VISACM_ClearEntireTable()

Purpose

Clear all cached settings stored by the Conflict Manager.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The Conflict Manager's settings have been successfully cleared.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_ALLOC	Insufficient system resources to make the change to the Conflict Manager settings.

Description

This function clears all settings currently cached by the Conflict Manager. After this function is called, there will be no preferred VISA, no disabled VISA libraries, and no record of any instruments having been accessed by a VISA library.

3.2.3.3. VISACM_ClearResourceHandlersFromTable()

Purpose

Deletes all records of resources that were previously attempted to be opened by a VISA library.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The records of all previous resource opening attempts were deleted by the Conflict Manager.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.

Description

This function clears all records of any attempted opens by any VISA library on resources. Following this call, all resources will be treated as never opened upon the next open attempt.

3.2.3.4. VISACM_Close()

Purpose

Signals to the Conflict Manager that the caller is finished with Conflict Manager actions.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The Conflict Manager handled the close operation successfully.

Error Codes	Description
VI_ERROR_CLOSING_FAILED	The Conflict Manager failed to successfully close. This can occur if the Conflict Manager has not been correctly initialized, or if writing settings to file failed.

Description

This function should be called when the client process is finished using the Conflict Manager. Calling this function ensures that new settings are stored and that cleanup occurs properly.

3.2.3.5. VISACM_CreateHandler(interfaceType, interfaceNumber, sessionType, guid_SRM, conflictHandlerType, comments)

Purpose

Creates a record of an open attempt by a VISA library on a resource.

Parameters

Name	In/Out	Type	Description
interfaceType	IN	ViUInt16	The target resource's interface type. This is identical to the VI_ATTR_INTF_TYPE specified by the VISA specification.
interfaceNumber	IN	ViUInt16	The target resource's interface number. This is identical to the VI_ATTR_INTF_NUM specified by the VISA specification.
sessionType	IN	ViConstString	The type of resource being opened. For example, GPIB has both INSTR and BACKPLANE resources. This parameter would hold that type.

guid_SRM	IN	ViConstString	The GUID of the calling VISA library. The GUID should be passed in the format XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX.
conflictHandlerType	IN	ViInt16	An enumeration signaling whether the setting is a user-specified setting, a Conflict Manager defined success, or a failure.
comments	IN	ViConstString	Any extra comments regarding this setting. Passing NULL signals that no comments should be kept.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The desired setting was added to the Conflict Manager's stored settings.

Error Codes	Description
VI_ERROR_ALLOC	Insufficient system resources to make the change to the Conflict Manager settings.
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_INV_RSRC_NAME	The GUID string passed by the user was not a valid GUID string.
VI_ERROR_INV_SETUP	The current Conflict Manager settings are incompatible with the desired setting. For example, the new record's VISA is a disabled VISA which cannot have any stored records.
VI_ERROR_USER_BUF	A buffer passed by the user was not a valid buffer.

Description

This call is used to create new records in the Conflict Manager's settings cache. For end users, the main use would be to specify a specific VISA for a given resource. When a setting is user-specified (as opposed to Conflict Manager specified), it is never overridden, even if the open attempt fails.

Any new setting created by this function must conform to any settings already made. For example, a record may not be created for a disabled VISA.

3.2.3.6. VISACM_DeleteHandler(interfaceType, interfaceNumber, sessionType, guid_SRM)

Purpose

Deletes a setting corresponding to both a specific VISA library and a specific resource.

Parameters

Name	In/Out	Type	Description
interfaceType	IN	ViUInt16	The target resource's interface type. This is identical to the VI_ATTR_INTF_TYPE specified by the VISA specification.
interfaceNumber	IN	ViUInt16	The target resource's interface number. This is identical to the VI_ATTR_INTF_NUM specified by the VISA specification.
sessionType	IN	ViConstString	The type of resource being opened. For example, GPIB has both INSTR and BACKPLANE resources. This parameter would hold that type.
guid_SRM	IN	ViConstString	The GUID of the calling VISA library. The GUID should be passed in the format XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The record either does not exist or was successfully cleared.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_INV_RSRC_NAME	The GUID string passed by the user was not a valid GUID string.
VI_ERROR_INV_SETUP	The current Conflict Manager settings are incompatible with the desired setting. For example, the new record's VISA is a disabled VISA which cannot have any stored records.
VI_ERROR_USER_BUF	A buffer passed by the user was not a valid buffer.

Description

This function is called when a setting needs to be deleted. Much like the above VISACM_CreateHandler() function, the function should be used by external applications to manipulate user-specified resource settings.

3.2.3.7. VISACM_DeleteHandlerByGUID(guid_SRM)

Purpose

Delete all records for a VISA library identified by GUID.

Parameters

Name	In/Out	Type	Description
guid_SRM	IN	ViConstString	The GUID of the VISA library to remove. The GUID should be passed in the format XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	All records for the specified VISA were successfully removed.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_INV_RSRC_NAME	The GUID string passed by the user was not a valid GUID string.
VI_ERROR_USER_BUF	A buffer passed by the user was not a valid buffer.

Description

This function deletes all records for a specified VISA library. This function is designed for use when a VISA library is removed from the system.

3.2.3.8. VISACM_DeleteResourceByIndex(resourceIndex)

Purpose

Delete all records for a resource specified by index.

Parameters

Name	In/Out	Type	Description
resourceIndex	IN	ViInt32	The index of the resource to remove

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	All records for the specified resource were successfully removed.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_RSRC_NFOUND	The index provided was outside the bounds of the Conflict Manager's records.

Description

This function deletes a resource from the Conflict Manager's cache. The index used by this function corresponds to the index used by VISACM_QueryResource().

3.2.3.9. VISACM_FindChosenHandler(interfaceType, interfaceNumber, sessionType, guid_SRM[], conflictHandlerType)

Purpose

Find the VISA library selected by the Conflict Manager to open a resource.

Parameters

Name	In/Out	Type	Description
interfaceType	IN	ViUInt16	The target resource's interface type. This is identical to the VI_ATTR_INTF_TYPE specified by the VISA specification.
interfaceNumber	IN	ViUInt16	The target resource's interface number. This is identical to the VI_ATTR_INTF_NUM specified by the VISA specification.
sessionType	IN	ViConstString	The type of resource being opened. For example, GPIB has both INSTR and BACKPLANE resources. This parameter would hold that type.

guid_SRM	OUT	ViChar[]	The GUID of the selected VISA library.
conflictHandlerType	OUT	ViPInt16	An enum representing whether the resource was chosen by the Conflict Manager or specified by the user

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The Conflict Manager successfully supplied the VISA library to be used for opening the resource.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_RSRC_NFOUND	No resource was found that was previously selected to open this resource.
VI_ERROR_USER_BUF	A buffer passed by the user was not valid.

Description

This function is used to determine which installed VISA library will be used to open the supplied resource. If no VISA library has previously opened the device, and no user setting has been supplied, an error is returned.

3.2.3.10. VISACM_FlushConflictFile(behavior, fileOnDiskWasNewer)

Purpose

Flush any new settings made to the Conflict Manager settings file on disk.

Parameters

Name	In/Out	Type	Description
behavior	IN	ViInt16	An enum specifying how the Conflict Manager should react if the settings file has been edited by another process.
fileOnDiskWasNewer	OUT	ViPBoolean	A Boolean signaling whether the file on the disk is newer than the one loaded by the client process.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The settings were successfully flushed to the settings file on disk.

Error Codes	Description
VI_ERROR_FILE_ACCESS	The Conflict Manager failed to write to the settings file. This is likely due to invalid permissions.
VI_ERROR_INV_MODE	The value passed for the behavior was invalid.
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_WARN_NULL_OBJECT	Either no settings had been changed in memory, or the settings file was not overwritten based on the specified behavior.

Description

This function flushes any changes made to Conflict Manager settings to the settings file on disk. The behavior parameter determines what actions the function takes if the file on disk has been updated by another process.

3.2.3.11. VISACM_GetConflictTableFilename(filename)

Purpose

Get the name of the Conflict Manager settings file.

Parameters

Name	In/Out	Type	Description
filename	OUT	ViChar[]	The path and name of the Conflict Manager settings file.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The settings file information was successfully returned.

Error Codes	Description

VI_ERROR_FILE_ACCESS	The Conflict Manager could not access the required path.
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_INV_SETUP	The path required by the Conflict Manager does not exist.
VI_ERROR_USER_BUF	A buffer passed by the user was not valid.

Description

Get the name of the file where the Conflict Manager settings will be kept. This file does not necessarily need to exist.

3.2.3.12. VISACM_GetIsDirty(isDirty)

Purpose

Get whether any Conflict Manager settings have been changed since the last flush of the settings to disk.

Parameters

Name	In/Out	Type	Description
isDirty	OUT	ViPBoolean	The variable specifying whether the settings in memory have been written to disk.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The status of the settings in memory has been successfully returned.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_USER_BUF	The output variable pointer passed to the function was invalid.

Description

This function returns whether the settings in memory have changed since the last write to disk.

3.2.3.13. VISACM_GetInstalledVisa(index, vendorID, guid_SRM[], visaPathLocation[], visaFriendlyName[], comments[])

Purpose

Get information about an installed VISA library based on a supplied index.

Parameters

Name	In/Out	Type	Description
index	IN	ViInt32	The index determining which VISA library's information gets returned.
vendorID	OUT	ViPUInt16	The vendor ID number of the VISA library's vendor.
guid_SRM	OUT	ViChar[]	The GUID associated with the VISA library.
visaPathLocation	OUT	ViChar[]	The path and filename of the vendor-specific VISA library.
visaFriendlyName	OUT	ViChar[]	The friendly name of the VISA library, determined by the vendor.
comments	OUT	ViChar[]	Any comments regarding the specified VISA library.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The information for the VISA library at the given index was successfully returned.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_RSRC_NFOUND	A VISA library corresponding to the given index could not be found. This could be due to an out-of-range index or corruption of the VISA information in the registry.
VI_ERROR_USER_BUF	A buffer passed by the user was not valid.

Description

This function returns information for a vendor-specific VISA library based on a given index. While most of the data returned by this function is mainly for informational use, the GUID can be used by other functions to determine what resources a vendor-specific VISA library is currently set to access.

3.2.3.14. VISACM_GetInstalledVisaCount(numberOfVisas)

Purpose

Get the total number of vendor-specific VISA libraries installed on the system.

Parameters

Name	In/Out	Type	Description
numberOfVisas	OUT	ViPInt32	The number of VISA libraries installed on the system.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The number of VISA libraries on the system was successfully returned.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_RSRC_NFOUND	No installed VISA libraries were found.
VI_ERROR_USER_BUF	The output variable passed to the function was invalid.

Description

This functions returns the total number of installed vendor-specific VISA libraries on the system. The value returned by this can be used to iterate through the installed VISA libraries using the VISACM_GetInstalledVisa() function.

3.2.3.15. VISACM_GetResourceCount(numberRsrcs)

Purpose

Gets the number of resources with settings stored by the Conflict Manager.

Parameters

Name	In/Out	Type	Description

numberRsrcs	OUT	ViPInt32	The number of resources with settings stored in the Conflict Manager.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The number of resources stored by the Conflict Manager was successfully returned.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_USER_BUF	The output variable passed to the function was invalid.

Description

This function gets the number of resources with settings stored by the Conflict Manager. The value returned by this function can be used to iterate through resource records using VISACM_QueryResource().

3.2.3.16. VISACM_GetStoreConflictsOnly(conflictSetting)

Purpose

Returns whether the Conflict Manager is storing settings only for resources with multiple VISA libraries able to parse the resource string.

Parameters

Name	In/Out	Type	Description
conflictSetting	OUT	ViBoolean	A variable representing whether the Conflict Manager is storing only resources with multiple VISA libraries finding the resource.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The setting was successfully returned by the function.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_USER_BUF	The output variable passed to the function was invalid.

Description

This function returns whether the Conflict Manager is storing settings only for resources with multiple VISA libraries able to parse the resource string. If this setting is false, then the Conflict Manager stores settings for all resources, even when no conflicts exist.

3.2.3.17. VISACM_GetVisaEnabled(guid_SRM, enabled)

Purpose

Returns whether a specific VISA library is enabled or disabled.

Parameters

Name	In/Out	Type	Description
guid_SRM	IN	ViConstString	The GUID identifying the VISA for which to retrieve its enabled status.
enabled	OUT	ViPBoolean	The variable specifying whether the VISA is enabled or disabled.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The enabled status for the VISA was returned successfully.

Error Codes	Description

VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_INV_RSRC_NAME	The GUID supplied to the function was invalid. GUID values should be in XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX format.
VI_ERROR_USER_BUF	The output variable passed to the function was invalid.

Description

The function returns whether a given VISA is enabled. A VISA that is disabled will not be used by the Conflict Manager and may not have any other settings associated with it.

3.2.3.18. VISACM_GetVisaPreferred(guid_SRM[])

Purpose

Get the GUID for the preferred VISA library.

Parameters

Name	In/Out	Type	Description
guid_SRM	OUT	ViChar[]	The GUID of the preferred VISA library on the system. The ViChar array should be at least 36 characters long.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The GUID for the preferred VISA library was returned successfully.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_RSRC_NFOUND	No preferred VISA is specified on the system.
VI_ERROR_USER_BUF	The output variable passed to the function was invalid.

Description

This function returns the GUID of the preferred VISA library. If no VISA library has been specified as preferred, an error is returned.

3.2.3.19. VISACM_Initialize()

Purpose

Initialize the Conflict Manager library for use by the client application.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The Conflict Manager library was initialized successfully.

Error Codes	Description
VI_ERROR_ALLOC	The Conflict Manager failed to initialize.

Description

This function initializes the Conflict Manager library for use by a client application. This function must be called before any other function for the Conflict Manager to be used.

3.2.3.20. VISACM_QueryResource(resourceIndex, interfaceType, interfaceNumber, sessionType[], numHandlers)

Purpose

Queries the properties of a resource stored in the Conflict Manager settings cache based on a provided index.

Parameters

Name	In/Out	Type	Description
resourceIndex	IN	ViInt32	The index of the resource for which to retrieve information.
interfaceType	OUT	ViPUInt16	The target resource's interface type. This is identical to the VI_ATTR_INTF_TYPE specified by the VISA specification.
interfaceNumber	OUT	ViPUInt16	The target resource's interface number. This is identical to the VI_ATTR_INTF_NUM specified by the VISA specification.
sessionType	OUT	ViChar[]	The type of resource being opened. For example, GPIB has both INSTR and BACKPLANE resources. This parameter would hold that type.
numHandlers	OUT	ViPInt16	The number of records stored for the specified resource.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The information for the specified resource was returned successfully.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_RSRC_NFOUND	A resource corresponding to the given index could not be found. This is most likely due to an out-of-range index.
VI_ERROR_SYSTEM_ERROR	The function failed to access the Conflict Manager settings successfully.
VI_ERROR_USER_BUF	A buffer passed by the user was not valid.

Description

This function queries the properties of the resources corresponding to the given index. This function is mainly meant to be used to iterate through resource stored by the Conflict Manager. VISACM_QueryResourceHandler() can be used to iterate through the handler records for each resource.

3.2.3.21. VISACM_QueryResourceHandler(resourceIndex, handlerIndex, guid_SRM[],conflictHandlerType, comments[])

Purpose

Query a record for how a given VISA library is set to handle a specific resource.

Parameters

Name	In/Out	Type	Description
resourceIndex	IN	ViInt32	The index corresponding to the resource.
handlerIndex	IN	ViInt32	A provided index corresponding to which VISA library record should be returned.
guid_SRM	OUT	ViChar[]	The GUID of the VISA library specified by this record
conflictHandlerType	OUT	ViPInt16	An enum representing whether this VISA library set by the user to handle this resource, chosen by the Conflict Manager to handle this resource, or set to not handle the resource.

comments	OUT	ViChar[]	A character string containing any comments stored with the record.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The information from the record was returned successfully.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_RSRC_NFOUND	Either the resource index or the handler index was invalid.
VI_ERROR_SYSTEM_ERROR	The function failed to access the Conflict Manager settings successfully.
VI_ERROR_USER_BUF	A buffer passed by the user was not valid.

Description

This function queries how a specific VISA library is set to handle a given resource. A VISA library can either be chosen by the user, chosen by the Conflict Manger, or set to not handle a given resource. Using VISACM_QueryResource() in tandem with this function can provide a complete picture of the Conflict Manager's configuration.

3.2.3.22. VISACM_ReloadFile()

Purpose

Reload settings from the Conflict Manager's settings file.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The settings were successfully loaded from the Conflict Manager's settings file on disk.

Error Codes	Description
VI_ERROR_ALLOC	The settings failed to load due to a failed allocation.
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.

Description

This function reloads the settings from the Conflict Manager's settings file. If the file cannot be read, the settings revert to the default settings.

3.2.3.23. VISACM_SetStoreConflictsOnly(storeConflicts)

Purpose

Sets whether the Conflict Manager should store only conflicts in the table.

Parameters

Name	In/Out	Type	Description
storeConflicts	IN	ViBoolean	Determines whether the Conflict Manager will store only conflicted entries or all entries.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The setting was set successfully.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.

Description

This function sets whether the Conflict Manager stores only conflicts in the table or the results of all resource openings. Saving all of the results from opening results in a larger table, but prevents the VISA Router from repeating the conflict arbitration algorithm on every open.

3.2.3.24. VISACM_SetVisaEnabled(guid_SRM, enabled)

Purpose

Enables or disables a specified VISA library.

Parameters

Name	In/Out	Type	Description
guid_SRM	IN	ViConstString	The GUID of the VISA library to enable or disable. The GUID should be provided in XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX format.
enabled	IN	ViBoolean	Specifies whether the VISA library should be enabled or disabled.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The VISA library was successfully disabled.

Error Codes	Description
VI_ERROR_ALLOC	The Conflict Manager could not allocate needed memory for the new setting.
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_INV_RSRC_NAME	The specified GUID was not valid.
VI_ERROR_USER_BUF	A buffer passed by the user was not valid.

Description

Enables or disables a specified VISA library. A disabled VISA library will have all of its records deleted from the conflict table and will not be used when opening any resources. When reenabling a VISA library, the user may want to clear the entire table to repopulate the table with settings using the reenabled VISA library.

3.2.3.25. VISACM_SetVisaPreferred(guid_SRM)

Purpose

Sets a VISA library as the preferred VISA library.

Parameters

Name	In/Out	Type	Description
guid_SRM	IN	ViConstString	The GUID corresponding to the VISA library to set as preferred.

Return Values

Type ViStatus — This is the operational return status. It returns either a completion code or an error code as follows.

Completion Code	Description
VI_SUCCESS	The VISA library was successfully set as the preferred VISA library.

Error Codes	Description
VI_ERROR_INV_OBJECT	The Conflict Manager Library has not been properly initialized. Ensure that VISACM_Initialize () has been called before attempting to configure Conflict Manager Settings.
VI_ERROR_INV_RSRC_NAME	The specified GUID was not valid.
VI_ERROR_INV_SETUP	The VISA library specified to be preferred is disabled. This is not a valid setup and returns an error instead of making this setting.
VI_ERROR_USER_BUF	A buffer passed by the user was not valid.

Description

This function sets a VISA library as the preferred VISA library. As the preferred VISA library, this library is used to open all resources on the system, unless that resource has a user-specified preference.

3.2.4. VISA Utilities

The VISA Utilities component is supported only on the WIN64 framework.

The VISA Utilities component provides support to the VISA Router for mapping the VISA object handles of the underling vendor-specific VISA object handles to the VISA object handles that are presented to the user. `visaUtilities.dll` exports a number of entry points, most of which are used internally by the VISA router and are not documented in this specification.

Only the getUserVi() entry point is documented here because, given a vendor-specific VISA object handle, it returns the user-visible VISA object handle. This is useful for vendor-provided utilities that deal with vendor-specific object handles, but need to display the user-visible object handles returned from the VISA Router.

3.2.4.1. getUserVi (underlyingVi, underlyingManfId)

Purpose

Map a vendor-specific VISA object handle to the user-visible VISA object handle used by the VISA Router.

Parameters

Name	In/Out	Type	Description
underlyingVi	IN	const ViSession	A vendor-specific VISA object handle.
underlyingManfId	IN	const ViUInt16	The VI_ATTR_RSRC_MANF_ID value for this vendor-specific VISA.

Return Values

Type ViSession — This is the user-visible VISA object handle that corresponds to the underlying vendor-specific VISA object handle that was passed in.

If 0 is passed in as the underlyingVi, the value returned is 0. If there is no corresponding user-visible VISA object handle, the value returned is that of the underlying VI.

Description

This function is useful for vendor-provided utilities that deal with vendor-specific object handles, but which need to display the objecthandle that the VISA Router has presented to the user. The VISA Router hides the vendor-specific handle from the user, so a vendor utility that presents objectinformation to the user needs a way to convert the hidden vendor-specific objecthandle to the user-visible objecthandle that has meaning to the user.

Note that both the vendor-specific VISA objecthandle and the vendor Manufacturer ID are required to determine the user-visible VISA objecthandle. This is because the vendor-specific VISA objecthandle may not be unique.

3.3. VISA COM Components

Table 3.3.1 shows a list of files included in the VISA Shared Components. See *VPP-4.3.4, VISA Implementation Specification for COM,* for details of these components.

Component Name	32-Bit	64-Bit	Description
`GlobMgr.dll`	X	X	The Global Resource Manager (GRM) COM Component and the VISA COM I/O type library.
`BasFrmIO.dll`	X	X	A standard implementation of the VISA COM IFormattedIO488 interface.
`Ivi.Visa.Interop.dll` `Ivi.Visa.Interop.xml`	X	X	The primary interop assembly (PIA) for the VISA COM I/O type library, along with the PIA intellisense help file.
`Ivi.Visa.Interop.config` `Policy.X.X.Ivi.Visa.Interop.xml`	X		The policy file that forwards calls from previous versions of the VISA COM PIA to the current version. X.X may stand for any previous version that is forwarded to the current PIA. There may be multiple policy files, one for each major.minor version that is forwarded.
`IviPiaRegistration.bat`	X	X	A batch program that can be run by users to make sure that all of the IVI PIAs are properly registered in the Global Assembly Cache (GAC).

Table 3.3.1

3.4 VISA Shared USBTMC Device Driver

Table 3.4.1 shows a list of files included in the VISA Shared Components. See *IVI 6.2 , VISA Interoperability Requirement for USBTMC Specification,*for details of this component.

Component Name	32-Bit	64-Bit	Description
`ausbtmc.sys`	X	X	The signed kernel binary containing the USBTMC driver logic.
`ausbtmc.cat`	X	X	The catalog file containing the digital signature for the kernel driver.
`ausbtmc.inf`	X	X	The setup information file detailing installation behavior for the kernel driver.

Table 3.4.1

Section 4: VISA Shared Components Installers

Section 3 described the components required for a complete VISA COM I/O implementation. This section covers the details of the installation and gives detailed requirements of the components' implementation.

There are two installers, one for 32-bit Windows operating systems and one for 64-bit operating systems. The 32-bit installer installs 32-bit components only. The 64-bit installer installs both 32-bit and 64-bit components, with 32-bit components installed so that they can be run using Microsoft's Windows on Windows 64 (WOW64) technology.

4.1. Installing VISA Shared Components On 32-Bit Operating Systems

TERMS

The following terms are used in this section.

- <*SYSTEM32DIR*> is the Windows system directory for executables. The default is C:\Windows\System32, but this may be changed when Windows is installed.
- <*PROGRAMFILES*> is the Windows Program Files directory. The default is C:\Program Files, but this may be changed when Windows is installed.
- <*ALLUSERSAPPDATA*> is the Windows directory where data that is accessible to all users is stored (as opposed to data that is accessible to the current user).
- <*VXIPNPPATH*> is the target directory for the VISA components on 32-bit systems.
- <*VISADATAPATH*> is the directory used for VISA data files, and the conflict resolution table in particular.

RULE 4.1.1

The VISA Shared Components installer for Windows 2000, Windows XP, and Windows Vista 32 **SHALL** be named *VISA Shared Components* and **SHALL** have its own entry in the Windows Add/Remove Programs list.

RULE 4.1.2

Every 32-bit vendor-specific VISA installer released after June 1, 2009 **SHALL** use the VISA Shared Components installer to install shared VISA COM or VISA Plug-In Architecture files, or to create standard VISA directories, registry keys and values, or environment variables, and **SHALL NOT** install the components or create standard VISA directories, registry keys and values, or environment variables as part of the vendor-specific installer.

RULE 4.1.3

The value of <VXIPNPPATH>**:**.

- **IF** the registry key HKLM\SOFTWARE\VXIPNP_Alliance\VXIPNP\CurrentVersion exists and contains the value VXIPNPPATH, and this value designates a directory that exists, and the directory or any of the subdirectories contain any files, **THEN** the value of <VXIPNPPATH> **SHALL** be the value of the this key's VXIPNPPATH string value.
- **OTHERWISE**, the default value of <VXIPNPPATH> **SHALL** be <PROGRAMFILES>\IVI Foundation\VISA **AND** the VISA Shared Components installer **SHALL** allow the user to change the value of <VXIPNPPATH>.

OBSERVATION 4.1.1

The above rules regarding the VISA Shared Components installer dictate that it detect existing VISA components and other VXI*plug&play* components such as instrument drivers. If the VXI*plug&play* registry keys point to a VXI*plug&play* root directory, and that directory exists, but no files exist in the hierarchy to which they point, it is acceptable for the VISA Shared Components installer to allow the user to change the 32-bit VISA base directory. In this case, the VISA Shared Components installer changes the VXI*plug&play* registry keys and the environment variables if necessary, but it leaves the old, empty directory hierarchy alone (that is, it does not remove it).

RULE 4.1.4

The value of <VISADATAPATH> **SHALL** be <ALLUSERSAPPDATA>\IVI Foundation\VISA.

RULE 4.1.5

The VISA Shared Components installer **SHALL** create any of the following directories that do not already exist:

- <VXIPNPPATH>
- <VXIPNPPATH>\VisaCom
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies
- <VXIPNPPATH>\WinNT
- <VXIPNPPATH>\WinNT\Bin
- <VXIPNPPATH>\WinNT\include
- <VXIPNPPATH>\WinNT\lib
- <VXIPNPPATH>\WinNT\lib\bc
- <VXIPNPPATH>\WinNT\lib\msc
- <VXIPNPPATH>\WinNT\lib_x64
- <VXIPNPPATH>\WinNT\lib_x64\msc
- <VISADATAPATH>

RULE 4.1.6

The VISA Shared Components installer **SHALL** install the following files, unless newer versions of the files are already installed:

- <SYSTEM32DIR>\visaConfMgr.dll (32-bit executable)
- <VXIPNPPATH>\VisaCom\GlobMgr.dll (32-bit executable)
- <VXIPNPPATH>\VisaCom\BasFrmIO.dll (32-bit executable)
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\Ivi.Visa.Interop.dll (32-bit executable)
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\Ivi.Visa.Interop.xml
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\Ivi.Visa.Interop.config
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\Policy.1.0.Ivi.Visa.Interop.dll (32-bit executable, one for each major/minor previous version that must be redirected to the current version of `Ivi.Visa.Interop.dll`. *X.X* stand for the previous major/minor versions being redirected.)
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\IviPiaRegistration.bat
- <VXIPNPPATH>\WinNT\include\visa.h
- <VXIPNPPATH>\WinNT\include\visatype.h
- <VXIPNPPATH>\WinNT\lib_x64\msc\visa64.lib
- ausbtmc.cat (location determined by Windows during driver installation process)
- ausbtmc.inf (location determined by Windows during driver installation process)

- ausbtmc.sys (32-bit kernel driver file, location determined by Windows during driver installation process)

RULE 4.1.7

The VISA Shared Components installer **SHALL NOT** replace an existing conflict resolution table file.

RULE 4.1.8

The VISA Shared Components installer **SHALL** create registry keys and values for GlobMgr.dll and BasFrmIO.dll as if regsvr32 was run on them. It **SHALL NOT** self register these components.

OBSERVATION 4.1.2

Note that the registry keys and values that are created by self-registering 32-bit COM type libraries on a 32-bit operating system are different than the registry keys and values created by self-registering the same 32-bit type library on a 64-bit system. These changes are more extensive than just relocating keys to the WOW64 registry hive—the number of subkeys actually is different. If the 32-bit installer creates registry keys and values that match the self-registration keys and values on a 32-bit operating system, they will not match the self-registration keys and values on a 64-bit operating system, and vice versa. This is one reason why the 32-bit installer installs only on 32-bit operating systems.

RULE 4.1.9

The VISA Shared Components installer **SHALL** create registry keys and values for `Ivi.Visa.Interop.dll` as if the 32-bit version of regasm was run on it. It **SHALL NOT** run regasm from within the installer.

RULE 4.1.10

The VISA Shared Components installer **SHALL** create the following additional registry keys and values under HKLM\SOFTWARE:

- VXIPNP_Alliance
- VXIPNP_Alliance\IVIVISACOM
- VXIPNP_Alliance\IVIVISACOM\CurrentVersion
    - Value: InstallerVersion—The version of the VISA Shared Components installer.
    - Value: Version—The product version of `GlobMgr.dll`
- VXIPNP_Alliance\VXIPNP
- VXIPNP_Alliance\VXIPNP\CurrentVersion
    - Value: FRAMEWORK_PATH—<VXIPNPPATH>\WinNT
    - Value: VXIPNPPATH—<VXIPNPPATH>

Note that there no default values for any of the above keys.

RULE 4.1.11

The VISA Shared Components installer **SHALL** install on Windows 2000, Windows XP, and Windows Vista 32. Service Pack requirements may vary by version of the installer and are documented on the IVI web site for each version of the installer. The VISA Shared Components installer **SHALL NOT** install on

any version of Windows 95, Windows 98, Windows Me, Windows NT 4, or Windows Server 2003. The VISA Shared Components installer **SHALL NOT** install on any 64-bit Windows operating system.

RULE 4.1.12

The VISA Shared Components installer **SHALL** require that Internet Explorer 5.01 or higher already be installed.

PERMISSION 4.1.1

Vendors that include the VISA Shared Components installer in their distributions **MAY** place additional restrictions on the number of operating systems, service packs, or versions of Internet Explorer with which their distributions are compatible.

RULE 4.1.13

The VISA Shared Components installer **SHALL** install 64-bit VISA shared components, directories, registry keys, and environment variables, as necessary to enable development of 64-bit VISA and VISA COM applications.

RULE 4.1.14

The VISA Shared Components installer **SHALL NOT** include the .NET framework installer and **SHALL NOT** require that the .NET framework already be installed.

RULE 4.1.15

The VISA Shared Components installer **SHALL** create the VXIPNPPATH environment variable with a value of <VXIPNPPATH>.

RULE 4.1.16

The VISA Shared Components installer **SHALL** require that the user has administrative privileges.

RULE 4.1.17

The VISA Shared Components installer **SHALL** require the user to accept the IVI Foundation license.

RULE 4.1.18

The VISA Shared Components installer **SHALL** provide command line options to:

- Run silently (/q)
- msiexec.exe /i <PathToMSI> /q
  Set VXIPNPPATH
- msiexec.exe /i <PathToMSI> VXIPNPPATHDIR=<CustomVXIPNPPath>
  Repair the installation (/f)
  msiexec.exe /f <PathToMSI>

RULE 4.1.19

The VISA Shared Components uninstaller **SHALL** search for the following dependent software:

- Vendor Specific Resource Managers
- IVI Shared Components

IF dependent software is found, the uninstaller **SHALL** present a warning dialog to the user **AND** the dialog's default response **SHALL** be Cancel.

OBSERVATION 4.1.3

Even if dependent software is detected, a user still will be allowed to override the default and uninstall the VISA Shared Components. This is important for corner cases such as downgrading and cleaning up systems where some other component's uninstallation failed.

RULE 4.1.20

The VISA Shared Components uninstaller **SHALL** detect, after removing the files it installed, whether any remaining files or nonempty folders remain. **IF** no files remain, **THEN** the VISA Shared Components uninstaller **SHALL** remove the entire VXIplug&play directory structure, registry keys, and environment variable.

OBSERVATION 4.1.4

If the VISA Shared Components uninstaller detects remaining files, it leaves the VXI*plug&play* directory structure, registry keys, and environment variable intact. This is a "leak," but it is unavoidable.

RULE 4.1.21

On Windows Vista 32, the VISA Shared Components installer, if invoked in dialog mode without admin privileges, **SHALL** prompt for elevation. If the installer is invoked in silent mode without admin privileges, a failure condition exists and the installer **SHALL** abort.

RULE 4.1.22

On Windows Vista 32, the VISA Shared Components installer **SHALL** set the attributes of the VXI*plug&play* directory to allow modification without admin privileges. (This is an interim solution that will be reverted when the IVI Foundation specifies a revised directory structure that avoids placing writable files in the Program Files directory. Therefore, drivers and applications should not rely on users having write access to the VXI*plug&play* directory.)

RULE 4.1.23

The USBTMC kernel binary (ausbtmc.sys) and its associated files (ausbtmc.cat, ausbtmc.inf) **SHALL** be installed using the DIFx package provided by Microsoft. Please visit MSDN for more details regarding DIFx and device driver installation in general.

4.2. Installing VISA Shared Components On 64-Bit OS's

TERMS

The following terms are used in this section.

- <*SYSTEM32DIR*> is the Windows system directory for 64-bit executables. The default is C:\Windows\System32, but this may be changed when Windows is installed.
- <*SYSWOW64DIR*> is the Windows system directory for 32-bit executables. The default is C:\Windows\SysWOW64, but this may be changed when Windows is installed.
- <*PROGRAMFILES*> is the Windows Program Files directory. The default is C:\Program Files, but this may be changed when Windows is installed.
- <*PROGRAMFILESx86*> is the Windows Program Files (x86) directory. The default is C:\Program Files (x86), but this may be changed when Windows is installed.
- <*ALLUSERSAPPDATA*> is the Windows directory where application data that is accessible to all users is stored (as opposed to data that is accessible to the current user).
- <*VXIPNPPATH*> is the target directory for the 32-bit VISA components.
- <*VXIPNPPATH64*> is the target directory for the 64-bit VISA components.
- <*VISADATAPATH*> is the directory used for VISA data files, and the conflict resolution table in particular.

RULE 4.2.1

The VISA Shared Components installer for Windows Vista 64 **SHALL** be named *VISA Shared Components 64-Bit* and **SHALL** have its own entry in the Windows Add/Remove Programs list.

RULE 4.2.2

Every 64-bit vendor-specific VISA installer **SHALL** use the VISA Shared Components 64-bit installer to install shared VISA COM or VISA Plug-In Architecture files, and to create standard VISA directories, registry keys and values, or environment variables, and **SHALL NOT** install the components or create standard VISA directories, registry keys and values, or environment variables as part of the vendor-specific installer.

RULE 4.2.3

The VISA Shared Components 64-Bit installer **SHALL** install both the 32-bit VISA shared components, directories, registry keys, and environment variables, and the 64-bit VISA shared components, directories, registry keys, and environment variables.

OBSERVATION 4.2.1

The above rule serves several purposes. First, it eliminates problems that the 32-bit installer would have registering 32-bit type libraries on both 32-bit and 64-bit operating systems. Second, it minimizes potential issues with interactions between the 32-bit and 64-bit installers on 64-bit operating systems. Third, it supports cross-developing 32-bit and 64-bit executables on 64-bit operating systems.

RULE 4.2.4

The value of <VXIPNPPATH64>**:**.

- **IF** the registry key HKLM\SOFTWARE\VXIPNP_Alliance\VXIPNP\CurrentVersion exists and contains the value VXIPNPPATH, and this value designates a directory that exists, and the directory and all subdirectories do not contain any files, **THEN** the value of <VXIPNPPATH64> **SHALL** be the value of the this key's VXIPNPPATH string value.
- **OTHERWISE**, the default value of <VXIPNPPATH64> **SHALL** be <PROGRAMFILES>\IVI Foundation\VISA, **AND** the VISA Shared Components installer **SHALL** allow the user to change the value of <VXIPNPPATH64>.

RULE 4.2.5

The value of <VXIPNPPATH>**:**.

- **IF** the registry key HKLM\SOFTWARE\Wow6432Node\VXIPNP_Alliance\VXIPNP\CurrentVersion exists and contains the value VXIPNPPATH, and this value designates a directory that exists, and the directory and all subdirectories do not contain any files, **THEN** the value of <VXIPNPPATH> **SHALL** be the value of the this key's VXIPNPPATH string value.
- **OTHERWISE**, the default value of <VXIPNPPATH> **SHALL** be <PROGRAMFILES>\IVI Foundation\VISA, **AND** the VISA Shared Components installer **SHALL** allow the user to change the value of <VXIPNPPATH>.

OBSERVATION 4.2.2

The above rules dictate that the 64-bit installer detect existing VISA components and other VXI*plug&play* components such as instrument drivers.

- If the 32-bit VXI*plug&play* registry keys point to a 32-bit VXI*plug&play* root directory, and that directory exists, but no files exist in the hierarchy to which they point, it is acceptable for the VISA Shared Components installer to allow the user to change the 32-bit VISA base directory. In this case, the VISA Shared Components installer changes the 32-bit VXI*plug&play* registry keys and the environment variable if necessary, but it leaves the old, empty 32-bit directory hierarchy alone (that is, it does not remove it).
- If the 64-bit VXI*plug&play* registry keys point to a 64-bit VXI*plug&play* root directory, and that directory exists, but no files exist in the hierarchy to which they point, it is acceptable for the VISA Shared Components installer to allow the user to change the 64-bit VISA base directory. In this case, the VISA Shared Components installer changes the 64-bit VXI*plug&play* registry keys and the environment variable if necessary, but it leaves the old, empty 64-bit directory hierarchy alone (that is, it does not remove it).

RULE 4.2.6

The VISA Shared Components 64-Bit installer **SHALL** install 64-bit executables to 64-bit directories and 32-bit executables to the appropriate WOW64 directory. If the user specifies a directory that would result in 32-bit shared components being installed in a 64-bit only directory, the installer **SHALL** redirect the path to the corresponding WOW64 32-bit directory.

RULE 4.2.7

The value of <VISADATAPATH> **SHALL** be <ALLUSERSAPPDATA>\IVI Foundation\VISA.

OBSERVATION 4.2.3

<VISADATAPATH> is the same for both 32-bit and 64-bit components.

RULE 4.2.8

The VISA Shared Components 64-Bit installer **SHALL** create any of the following directories that do not already exist:

- <VXIPNPPATH>
- <VXIPNPPATH>\VisaCom
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies
- <VXIPNPPATH>\WinNT
- <VXIPNPPATH>\WinNT\Bin
- <VXIPNPPATH>\WinNT\include
- <VXIPNPPATH>\WinNT\lib
- <VXIPNPPATH>\WinNT\lib\bc
- <VXIPNPPATH>\WinNT\lib\msc
- <VXIPNPPATH>\WinNT\lib_x64
- <VXIPNPPATH>\WinNT\lib_x64\msc
- <VXIPNPPATH64>
- <VXIPNPPATH64>\VisaCom64
- <VXIPNPPATH64>\VisaCom64\Primary Interop Assemblies
- <VXIPNPPATH64>\Win64
- <VXIPNPPATH64>\Win64\Bin
- <VXIPNPPATH64>\Win64\include
- <VXIPNPPATH64>\Win64\lib_x64
- <VXIPNPPATH64>\Win64\lib_x64\msc
- <VISADATAPATH>

RULE 4.2.9

The VISA Shared Components 64-Bit installer **SHALL** install the following files, unless newer versions of the files are already installed:

- <SYSWOW64DIR>\visaConfMgr.dll (32-bit executable)
- <VXIPNPPATH>\VisaCom\GlobMgr.dll (32-bit executable)
- <VXIPNPPATH>\VisaCom\BasFrmIO.dll (32-bit executable)
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\Ivi.Visa.Interop.dll (32-bit executable)
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\Ivi.Visa.Interop.xml
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\Ivi.Visa.Interop.config

- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\Policy.X.X.Ivi.Visa.Interop.dll (32-bit executable, one for each major/minor previous version that needs to be redirected to the current version of `Ivi.Visa.Interop.dll`. *X.X* stand for the previous major/minor versions being redirected.)
- <VXIPNPPATH>\VisaCom\Primary Interop Assemblies\IviPiaRegistration.bat
- <VXIPNPPATH>\WinNT\include\visa.h
- <VXIPNPPATH>\WinNT\include\visatype.h
- <VXIPNPPATH>\WinNT\lib_x64\msc\visa64.lib
- <SYSTEM32DIR>\visa64.dll (64-bit executable)
- <SYSTEM32DIR>\visaConfMgr.dll (64-bit executable)
- <SYSTEM32DIR>\visaUtilities.dll (64-bit executable)
- <VXIPNPPATH64>\VisaCom64\GlobMgr.dll (64-bit executable)
- <VXIPNPPATH64>\VisaCom64\BasFrmIO.dll (64-bit executable)
- <VXIPNPPATH64>\VisaCom64\Primary Interop Assemblies\Ivi.Visa.Interop.dll (64-bit executable)
- <VXIPNPPATH64>\VisaCom64\Primary Interop Assemblies\Ivi.Visa.Interop.xml
- <VXIPNPPATH64>\VisaCom64\Primary Interop Assemblies\Ivi.Visa.Interop.config (Needed only if a policy file also is being installed.)
- <VXIPNPPATH64>\VisaCom64\Primary Interop Assemblies\IviPiaRegistration64.bat
- <VXIPNPPATH>\VisaCom64\Primary Interop Assemblies\Policy.X.X.Ivi.Visa.Interop.dll (64-bit executable, one for each major/minor previous version that needs to be redirected to the current version of `Ivi.Visa.Interop.dll`. *X.X* stand for the previous major/minor versions being redirected.)
- <VXIPNPPATH>\Win64\include\visa.h
- <VXIPNPPATH>\Win64\include\visatype.h
- <VXIPNPPATH>\Win64\lib_x64\msc\visa64.lib
- ausbtmc.cat (location determined by Windows during driver installation process)
- ausbtmc.inf (location determined by Windows during driver installation process)
- ausbtmc.sys (64-bit kernel driver file, location determined by Windows during driver installation process)

RULE 4.2.10

The VISA Shared Components installer **SHALL NOT** replace an existing conflict resolution table file.

RULE 4.2.11

The VISA Shared Components 64-Bit installer **SHALL** first create registry entries for the 32-bit and 64-bit versions of `GlobMgr.dll` and `BasFrmIO.dll` as if the 32-bit version of regsvr32 was run on the 32-bit versions and then the 64-bit version of regsvr32 was run on the 64-bit versions. It **SHALL NOT** self-register these components.

OBSERVATION 4.2.4

Note that the registry entries created by self-registering 32-bit COM type libraries on a 32-bit operating system are different than the registry entries created by self-registering the same 32-bit type library on a 64-bit system. These changes are more extensive than just relocating keys to the WOW64 registry hive—the number of subkeys is actually different. If the 32-bit installer creates registry entries that match the self-registration entries on a 32-bit operating system, they will not match the self-registration entries on a 64-bit operating system, and vice versa. This is one reason why the 64-bit installer installs only on 64-bit operating systems.

RULE 4.2.12

The VISA Shared Components 64-Bit installer **SHALL** first create registry entries for the 32-bit and 64-bit versions of `Ivi.Visa.Interop.dll` as if the 32-bit version of regasm was run on the 32-bit version, and then the 64-bit version of regasm was run on 64-bit version. It **SHALL NOT** run regasm from within the installer.

RULE 4.2.13

The VISA Shared Components 64-Bit installer **SHALL** create the following additional registry keys and values under HKLM\SOFTWARE:

- VXIPNP_Alliance
- VXIPNP_Alliance\IVIVISACOM
- VXIPNP_Alliance\IVIVISACOM\CurrentVersion
    - Value: InstallerVersion—The version of the VISA Shared Components installer.
    - Value: Version—The product version of `GlobMgr.dll`
- VXIPNP_Alliance\VXIPNP
- VXIPNP_Alliance\VXIPNP\CurrentVersion
    - Value: FRAMEWORK_PATH—<VXIPNPPATH64>\Win64
    - Value: VXIPNPPATH—<VXIPNPPATH64>

The VISA Shared Components 64-Bit installer **SHALL** create the following additional registry keys and values under HKLM\SOFTWARE\Wow6432Node:

- VXIPNP_Alliance
- VXIPNP_Alliance\IVIVISACOM
- VXIPNP_Alliance\IVIVISACOM\CurrentVersion
    - Value: InstallerVersion—The version of the VISA Shared Components installer.
    - Value: Version—The product version of `GlobMgr.dll`
- VXIPNP_Alliance\VXIPNP
- VXIPNP_Alliance\VXIPNP\CurrentVersion
    - Value: FRAMEWORK_PATH—<VXIPNPPATH>\WinNT
    - Value: VXIPNPPATH—<VXIPNPPATH>

RULE 4.2.14

The VISA Shared Components 64-Bit installer **SHALL** install on Windows Vista 64. Service Pack requirements may vary by version of the installer, and are documented on the IVI web site for each version of the installer. The VISA Shared Components 64-Bit installer **SHALL NOT** install on any 64-bit version of Windows XP or Windows Server 2003. The VISA Shared Components 64-Bit installer **SHALL NOT** install on any 32-bit Windows operating system.

PERMISSION 4.2.1

Vendors that include the VISA Shared Components 64-Bit installer in their distributions **MAY** place additional restrictions on the number of operating systems, service packs, or versions of Internet Explorer with which their distributions are compatible.

RULE 4.2.15

The VISA Shared Components 64-Bit installer **SHALL NOT** include the .NET framework installer and **SHALL NOT** require that the .NET framework already be installed.

RULE 4.2.16

The VISA Shared Components 64-Bit installer **SHALL** create the VXIPNPPATH environment variable with a value of <VXIPNPPATH> and the VXIPNPPATH64 environment variable with a value of <VXIPNPPATH64>.

RULE 4.2.17

The VISA Shared Components 64-Bit installer **SHALL** require that the user has administrative privileges.

RULE 4.2.18

The VISA Shared Components 64-Bit installer **SHALL** require the user to accept the IVI Foundation license.

RULE 4.2.19

The VISA Shared Components 64-Bit installer **SHALL** provide command line options to:

- Run silently (/q)
- msiexec.exe /i <PathTo64-BitMSI> /q
  Set VXIPNPPATH64 and VXIPNPPATH
- msiexec.exe /i <PathTo64-BitMSI> VXIPNPPATH64DIR=<Custom64-BitVXIPNPPath> VXIPNPPATHDIR=<CustomVXIPNPPath>
  Repair the installation (/f)

  msiexec.exe /f <PathTo64-BitMSI>

RULE 4.2.20

The VISA Shared Components 64-Bit uninstaller **SHALL** search for the following dependent software:

- Vendor Specific Resource Managers
- IVI Shared Components

IF dependent software is found, the uninstaller **SHALL** present a warning dialog to the user, **AND** the dialog's default response **SHALL** be Cancel.

OBSERVATION 4.2.5

Even if dependent software is detected, a user still will be allowed to override the default and uninstall the VISA Shared Components. This is important for corner cases such as downgrading and cleaning up systems where some other component's uninstallation failed.

RULE 4.2.21

The VISA Shared Components 64-Bit uninstaller **SHALL** detect, after removing the files it installed, whether any remaining files or non-empty folders remain. **IF** no files remain, **THEN** the VISA COM uninstaller **SHALL** remove the entire VXIplug&play directory structure and registry keys.

OBSERVATION 4.2.6

If the VISA Shared Components 64-Bit uninstaller detects remaining files, it leaves the VXI*plug&play* directory structure and registry keys intact. This is a "leak," but it is unavoidable.

RULE 4.2.22

If the VISA Shared Components 64-Bit installer is invoked in dialog mode without admin privileges, it **SHALL** prompt for elevation. If the installer is invoked in silent mode without admin privileges, a failure condition exists, and the installer **SHALL** abort.

RULE 4.2.23

On Windows Vista 64, the VISA Shared Components installer **SHALL** set the attributes of the VXI*plug&play* directory to allow modification without admin privileges. (This is an interim solution that will be reverted when the IVI Foundation specifies a revised directory structure that avoids placing writable files in the Program Files directory. Therefore, drivers and applications should not rely on users having write access to the VXI*plug&play* directory.)

RULE 4.2.24

The USBTMC 64-bit kernel binary (ausbtmc.sys) and its associated files (ausbtmc.cat, ausbtmc.inf) **SHALL** be installed using the DIFx package provided by Microsoft. Please visit MSDN for more details regarding DIFx and device driver installation in general.

Appendix A: Implementation Files

A.1 Contents of the visaRouter.h File

```
/*****************************************************************************
Distributed by IVI Foundation Inc.

Do not modify the contents of this file.
-----------------------------------------------------------------------------

Title   : visaRouter.h
Date    : 08-12-2008
Purpose : Define VISA attributes that apply to the VISA router.

*****************************************************************************/

#ifndef __VISAROUTER_HEADER__
#define __VISAROUTER_HEADER__

#define VI_ATTR_UNLOAD_PLUGINS_IF_LAST_RM (0x3FFF018CUL) // ViBoolean
#define VI_ATTR_UNDERLYING_VISA_SESSION   (0x3FFFA000UL) // ViSession
#define VI_ATTR_MULTI_SPEC_VERSION        (0x3FFFA001UL) // ViVersion
#define VI_ATTR_MULTI_MANF_NAME           (0x3FFFA002UL) // ViString
#define VI_ATTR_MULTI_MANF_ID             (0x3FFFA003UL) // ViUInt16
#define VI_ATTR_MULTI_IMPL_VERSION        (0x3FFFA004UL) // ViVersion

#endif // __VISAROUTER_HEADER__
```

A.2 Contents of the ConflictMgr.h File

```
/*-----------------------------------------------------------------------------*/
/* Distributed by IVI Foundation Inc.                                          */
/* Do not modify the contents of this file.                                    */
/*-----------------------------------------------------------------------------*/
/*                                                                             */
/* Title   : ConflictMgr.h                                                     */
/* Date    : 11-06-2007                                                        */
/* Purpose : Include file for the VISA Conflict Resolution Manager             */
/*                                                                             */
/*-----------------------------------------------------------------------------*/

#ifndef VISACM_CON_MGR
#define VISACM_CON_MGR

#include "visatype.h"

/* these enumerations are for conflict handler types */
#define VISACM_HANDLER_NOT_CHOSEN                       0
#define VISACM_HANDLER_CHOSEN_BY_RSRC_MGR               1
#define VISACM_HANDLER_CHOSEN_BY_USER                   2

/* these enumerations are for FlushConflictFile */
#define VISACM_FLUSH_OVERWRITE_ALWAYS                   0
#define VISACM_FLUSH_WRITE_IF_UNCHANGED                 1
#define VISACM_FLUSH_WRITE_OR_RELOAD                    2
```

```
#define VISACM_STRING_SIZE                                  256
#define VISACM_GUID_STRING_SIZE                             39  /* 32 hex digits + 4
dashes + null term char + surrounding braces */

#if defined(__cplusplus) || defined(__cplusplus__)
extern "C" {
#endif

   /* Initialize the DLL for use */
   ViStatus _VI_FUNC VISACM_Initialize();

   /* Close the DLL after use */
   ViStatus _VI_FUNC VISACM_Close();

   /* toggle conflict storage */
   ViStatus _VI_FUNC VISACM_SetStoreConflictsOnly(ViBoolean storeConflicts);   /* in
*/

   /* get storage setting */
   ViStatus _VI_FUNC VISACM_GetStoreConflictsOnly(ViPBoolean conflictSetting); /* out
*/

   /* get conflict table filename */
   ViStatus _VI_FUNC VISACM_GetConflictTableFilename(ViChar filename[]);       /* out
*/

   /* get number of conflict table entries */
   ViStatus _VI_FUNC VISACM_GetResourceCount(ViPInt32 numberRsrcs);            /* out
*/

   /* get number of conflict table entries */
   ViStatus _VI_FUNC VISACM_ClearResourceHandlersFromTable();

   /* create a new handler in conflict table */
   ViStatus _VI_FUNC VISACM_CreateHandler(
      ViUInt16 interfaceType,                           /* all in */
      ViUInt16 interfaceNumber,
      ViConstString sessionType,
      ViConstString guid_SRM,
      ViInt16 conflictHandlerType,
      ViConstString comments);

   /* delete a handler by specifying ALL identifying attributes */
   ViStatus _VI_FUNC VISACM_DeleteHandler(
      ViUInt16 interfaceType,                           /* all in */
      ViUInt16 interfaceNumber,
      ViConstString sessionType,
      ViConstString guid_SRM);

   /* delete all handlers for a specific GUID (for use when visa fails to load) */
   ViStatus _VI_FUNC VISACM_DeleteHandlerByGUID(ViConstString guid_SRM);       /* in
*/

   /* delete handler by index */
   ViStatus _VI_FUNC VISACM_DeleteResourceByIndex(ViInt32 resourceIndex);      /* in
*/

   /* find a handler for a interface number, type, and session type */
   ViStatus _VI_FUNC VISACM_FindChosenHandler(
      ViUInt16 interfaceType,                           /* in  */
      ViUInt16 interfaceNumber,                         /* in  */
      ViConstString sessionType,                        /* in  */
      ViChar guid_SRM[],                                /* out */
      ViPInt16 conflictHandlerType);                    /* out */

   /* get conflict table entry, mainly used to iterate through all entries */
   ViStatus _VI_FUNC VISACM_QueryResource(
```

```
      ViInt32 resourceIndex,                          /* in  */
      ViPUInt16 interfaceType,                        /* out */
      ViPUInt16 interfaceNumber,                      /* out */
      ViChar sessionType[],                           /* out */
      ViPInt16 numHandlers);                          /* out */

   /* get a handler for a specific interface and session type */
   ViStatus _VI_FUNC VISACM_QueryResourceHandler(
      ViInt32 resourceIndex,                          /* in  */
      ViInt32 handlerIndex,                           /* in  */
      ViChar guid_SRM[],                              /* out */
      ViPInt16 conflictHandlerType,                   /* out */
      ViChar comments[]);                             /* out */

   /* get preferred visa GUID and name */
   ViStatus _VI_FUNC VISACM_GetVisaPreferred(ViChar guid_SRM[]);              /* out
*/

   /* set preferred visa */
   ViStatus _VI_FUNC VISACM_SetVisaPreferred(ViConstString guid_SRM);         /* in
*/

   ViStatus _VI_FUNC VISACM_GetInstalledVisaCount(ViPInt32 numberOfVisas);    /* out
*/

   /* get installed visa by index */
   ViStatus _VI_FUNC VISACM_GetInstalledVisa(
      ViInt32 index,                                  /* in  */
      ViPUInt16 vendorID,                             /* out */
      ViChar guid_SRM[],                              /* out */
      ViChar visaPathLocation[],                      /* out */
      ViChar visaFriendlyName[],                      /* out */
      ViChar comments[]);                             /* out */

   /* get if a visa is enabled */
   ViStatus _VI_FUNC VISACM_GetVisaEnabled (
      ViConstString guid_SRM,                         /* in  */
      ViPBoolean enabled);                            /* out */

   /* set whether a visa is enabled or disabled */
   ViStatus _VI_FUNC VISACM_SetVisaEnabled (
      ViConstString guid_SRM,                         /* in  */
      ViBoolean enabled);                             /* in  */

   /* flush the table in memory to file */
   ViStatus _VI_FUNC VISACM_FlushConflictFile(
      ViInt16 behavior,                               /* in  */
      ViPBoolean fileOnDiskWasNewer);                 /* out */

   /* get whether any changes have been made to the table since load */
   ViStatus _VI_FUNC VISACM_GetIsDirty(ViPBoolean isDirty);                   /* out
*/

   /* reload the file from disk regardless of any changes in memory */
   ViStatus _VI_FUNC VISACM_ReloadFile();

   /* reset the table to no handlers, no preferred visa, and no disabled VISA
libraries */
   ViStatus _VI_FUNC VISACM_ClearEntireTable();

#if defined(__cplusplus) || defined(__cplusplus__)
} /* extern "C" brace */
#endif

#endif /* endif for IVI_CON_MGR macro */
```

A.3 Contents of the ConflictMgr.def File

```
EXPORTS
      VISACM_GetConflictTableFilename                    @1
      VISACM_CreateHandler                                     @2
      VISACM_DeleteHandler                                     @3
      VISACM_DeleteHandlerByGUID                         @4
      VISACM_DeleteResourceByIndex                       @5
      VISACM_FindChosenHandler                           @6
      VISACM_QueryResource                                     @7
      VISACM_QueryResourceHandler                              @8
      VISACM_ClearResourceHandlersFromTable              @9
      VISACM_GetVisaPreferred                            @10
      VISACM_SetVisaPreferred                            @11
      VISACM_GetInstalledVisa                            @12
      VISACM_GetResourceCount                            @13
      VISACM_SetStoreConflictsOnly                       @14
      VISACM_GetStoreConflictsOnly                       @15
      VISACM_GetInstalledVisaCount                       @16
      VISACM_FlushConflictFile                           @17
      VISACM_Initialize                                  @18
      VISACM_Close                                       @19
      VISACM_GetIsDirty                                  @20
      VISACM_SetVisaEnabled                              @21
      VISACM_GetVisaEnabled                              @22
      VISACM_ReloadFile                                  @23
      VISACM_ClearEntireTable                            @24
```

A.4 Contents of the visaUtilities.h File

```
/*****************************************************************************
Distributed by IVI Foundation Inc.

Do not modify the contents of this file.
-----------------------------------------------------------------------------

Title   : visaUtilities.h
Date    : 08-12-2008
Purpose : Define a function to obtain the user 'vi' from the internal 'vi'.
          This can be used to convert the 'vi' is used internally by a
          vendor VISA to the 'vi' that user sees which was returned by the
          VISA router.

*****************************************************************************/

#if !defined(VISAUTILITIES_H)
#define VISAUTILITIES_H

#if defined(__cplusplus) || defined(__cplusplus__)
   extern "C" {
#endif

ViSession _VI_FUNC getUserVi(const ViSession underlyingVi, const ViUInt16
underlyingManfId);

#if defined(__cplusplus) || defined(__cplusplus__)
   }
#endif

#endif // VISAUTILITIES_H
```

A.5 Contents of the visaUtilities.def File

```
LIBRARY     "visaUtilities"

EXPORTS
; Functions used internally by the VISA router
   viTableAdd                  @128
   viTableRemove               @129
   viTableLookup               @130
   viTableGetSessionCount      @131
   viTableAddToUserViMap       @132
   viTableRemoveFromUserViMap  @133

; Functions that can be called externally
   getUserVi                   @144
```