Products: FSP, FSU, FSQ, FSE, FSIQ, ESIB, ESPI, ZVR, ZVC, ZVM, ZVK

Remote Control of
R&S Spectrum and Network Analyzers
via LAN

Application Note

Spectrum and network analyzers equipped with network interface cards can be integrated in Local Area Networks (LAN). This Application Note describes how to remote control these instruments over a LAN and use VXIpnp instrument drivers over a LAN.

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1   Overview

Spectrum and network analyzers are high-end instruments that perform various measurement tasks in today's telecommunication industry. Integrated in a Local Area Network (LAN) such instruments can directly exchange data with various documentation tools or be remotely controlled.

To be integrated in a LAN, spectrum and network analyzers must be equipped with a network interface card.

This Application Note shows how to control Rohde & Schwarz spectrum and network analyzers over a local area network and use VXIpnp instrument drivers over a LAN. Rohde & Schwarz VXIpnp instrument drivers are based on VISA. Drivers can control the instrument via LAN if the RSIB interface and passport are installed.

VISA

VISA is a standardized software interface library providing input and output functions to communicate with measurement instruments. This standard is defined by the VXIplug&play Systems Alliance (http://www.vxipnp.org). These I/O functions are mostly independent of the device interface used; VXI, GPIB and RS-232 are currently supported. The I/O channel is selected at initialization time. Except for some interface specific configuration functions, the subsequent program code is independent of the I/O interface.
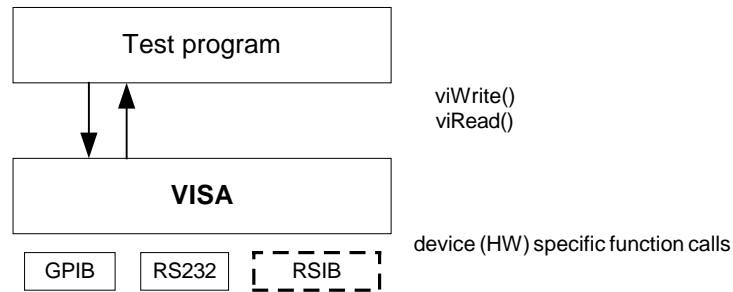
2   Remote Control via RSIB

The RSIB interface is a R&S defined protocol that uses the TCPIP protocol for communication with the instrument. It consists of a set of I/O functions very similar to the National Instruments NI-488.2 interface for GPIB.

The following table shows some corresponding functions:

NI-488.2 functions	RSIB functions
ibfind	RSDLLibfind
ibwrt	RSDLLibwrt
ibrd	RSDLLibrd

Installation, function reference and programming examples in Visual Basic and C are included in the operating manuals of the instruments that support this interface.

Remote control over RSIB is done on a message level basis using the SCPI command set of the instrument. Because the I/O functions are proprietary, VXIpnp instrument drivers cannot use the RSIB interface directly.

LabVIEW

National Instruments LabVIEW is a graphical development environment for test and measurement applications.

LabVIEW supports DLL loading and invoking DLL functions. Attached to this Application Note is a LabVIEW library, that contains wrappers for the RSIB functions. For documentation of the function parameters refer to the operating manual with the instrument.

The RSIB32.DLL does not perform any kind of memory management. It is therefore the responsibility of the application to allocate and free memory for output parameters of the RSIB functions. These parameters are passed by reference.

Agilent VEE

Agilent VEE is a graphical development environment for test and measurement applications.

Similar to LabVIEW VEE supports DLL loading and invoking DLL functions. For syntactical reasons the C header file of the RSIB interface (rsib.h)

cannot be included directly in VEE. However the C header file can be used as a reference for a modified include file that is used by VEE.

The RSIB32.DLL does not perform any kind of memory management. It is therefore the responsibility of the application to allocate and free memory for output parameters of the RSIB functions. These parameters are passed by reference.

Microsoft VB.NET

With the introduction of the .NET platform, Microsoft has introduced significant changes to Visual Basic. Attached to this application note is a VB.NET file that contains the function declarations of the RSIB interface in the VB.NET syntax. Add this module to your project for using the RSIB interface with VB.NET.
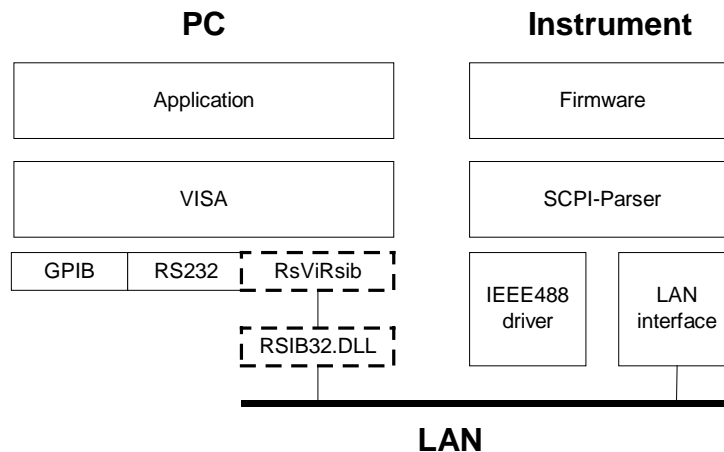
3 RSIB Passport for NI-VISA

This approach uses a plug-in wrapper, enabling RSIB to use a National Instruments VISA I/O library.

The RSIB passport can be installed on a host PC or locally on the instrument itself.

System Overview

This overview shows how to control an instrument via the passport (RsViRsib.dll), which in turn requires the RSIB interface (Rsib32.dll).

PC **Instrument**

Application	Firmware

VISA	SCPI-Parser

GPIB	RS232	RsViRsib

| RSIB32.DLL |

| IEEE488 driver | LAN interface |

LAN

Requirements

The RSIB passport requires NI-VISA V2.5 or higher to be installed. Note that NI-VISA has to be licensed separately.

For remote control via a LAN, the LAN option is required for the instrument. See the operating manual of the instrument for details on installing this option.

The IP communication protocol can be tested with the following command:

```
ping <hostname>
```

In the above example `<hostname>` can be either the absolute IP address of the instrument or the logical name, if some name resolution mechanism (e.g. DHCP) is used.

The user must have administrator rights in order to install the RSIB passport (Windows NT, 2000, XP).

Installation

Start **Setup.exe** from the installation media. If NI-VISA has not been installed, set-up is interrupted. To conform to the VISA standards, use the recommended installation path.

The following files are installed in these directories:

- **RSIB32.dll** in the Windows system directory (e.g. C:\WinNT\System32).

- **RsViRsib.dll** passport DLL in the VISA Bin directory which by default is **C:\VXIpnp\WinNT\Bin** for Windows NT4, 2000 and XP.

- **RsViRsib.ini** passport INI file in the **RSIB** subdirectory of the VISA directory which by default is **C:\VXIpnp\WinNT** for Windows NT4, 2000 and XP.

Additional information

The following entries are added to the Windows registry. They must not be modified by the user.

```
HKEY_LOCAL_MACHINE\SOFTWARE\National Instruments\NI-
VISA for Windows
95/NT\CurrentVersion\IoLibraries\RsViRsib.dll
```

– LibraryDescription   ⇨VISA Library Passport for RSIB-INSTR V1.3
– LibraryEnabled   ⇨ 0x00000001
– LibraryPath   ⇨ C:\VXIpnp\WinNT\Bin\RsViRsib.dll

Initialization file "RsViRsib.ini"

This file lists all resources which can be read by means of the viFindRsrc() VISA function. It is contained in the installed directory under …\Rsib. If the passport cannot find the INI file in the installed directory, it searches also the standard VISA directory (e.g. C:\VXIpnp\WinNT) under …\Rsib. Entries in NI-MAX or VISAIC are made only if resources are listed. The passport is nevertheless integrated so that the user can still start sessions.

Extract:

```
[RSIB-RSRC-ALIAS]

Name0 = "RSIB::192.168.1.33::INSTR"

Name1 = "RSIB::192.168.1.37::INSTR"

Name2 = "RSIB::FSP7::INSTR"
```

The TCP/IP address can be entered in decimal, octal or hexadecimal notation. In addition, a symbolic name can be used, if the network protocol provides a name resolution mechanism (e.g. by using a `hosts` file or by defining a domain name server (DNS)).

After successful installation and with the instrument connected to the LAN, the resources show up in NI-MAX under:
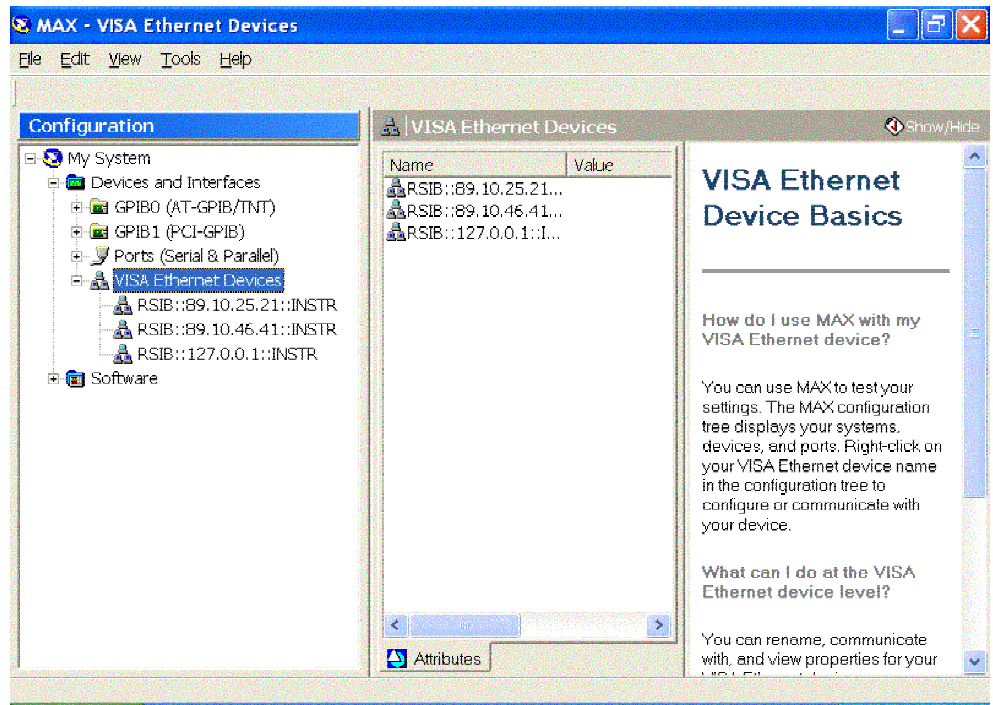
Header file "RsViRsib.h"

The header file contains all manufacturer-specific (R&S) attributes that are supported by the passport in addition to the VISA attributes. To address these attributes from a C program, simply include the header file.

Supported VISA Attributes

In addition to the standard VISA attributes, the RSIB passport supports the following manufacturer specific attributes:

- **RS_ATTR_RSIB_VER** – read-only, returns the version of the passport (e.g. 1.2)
- **RS_ATTR_RSIB_SRE** – switches the instrument to LOCAL (value = 0) or REMOTE (value = 1)
- **RS_ATTR_RSIB_LOC** – switches the instrument temporarily to LOCAL (no attribute value)

Supported Events

The RSIB passport supports the following events:
- VI_EVENT_SERVICE_REQ,
- VI_EVENT_IO_COMPLETION

4   Instrument Drivers and RSIB Passport for NI-VISA

Due to differences in the I/O protocol there are some limitations compared to VISA functions over GPIB. The RSIB interface does not support the VISA attribute VI_ATTR_TERMCHAR.

The current versions of the instrument drivers have a few functions that behave differently depending on the resource descriptor. All occurrences of

```
viGetAttribute (instrSession, VI_ATTR_TERMCHAR_EN,…)
viSetAttribute (instrSession, VI_ATTR_TERMCHAR_EN,…)
```

have to be disabled for RSIB resources.

For the FSEx driver, the following functions need modification:

- `rsfsex_dataReadTrace()`
- `rsfsex_dataReadSymbol()`
- `rsfsex_dataWriteTrace()`
- `rsfsex_dataWriteSymbol()`
- `rsfsex_dataReadTraceIQ()`
- `rsfsex_dataReadABIT()`
- `rsfsex_dataReadTraceWCDP()`
- `rsfsex_dataReadScan()`
- `rsfsex_dataReadStatus()`

For the ZVx driver, the following function needs modification:

- `rszv_dataReadTrace()`

5   Literature

For more information about the RSIB interface as well as for documentation of the remote control commands, refer to the operating manual of the instrument.

For a detailed documentation of VISA functionality refer to the VISA User Manual and the VISA Programmes Reference Guide.

6   Additional Information

Please contact **TM-Applications@rsd.rohde-schwarz.com** for comments and further suggestions.