



# **Systems Alliance**

## **VPP-1: Charter Document**

**February 24, 2010**

# VPP-1 Revision History

This section is an overview of the revision history of the VPP-1 document.

## **February 14, 2008**

Update charter document to reflect the merger of the *VXIplug&play* Systems Alliance into the IVI Foundation.

## **April 14, 2008**

Editorial change to update the IVI Foundation contact information in the Important Information section to remove obsolete address information and refer only to the IVI Foundation web site.

## **February 24, 2010**

Editorial change to include references to Windows 7.

## **NOTICE**

VPP-1: *Charter Document* 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](http://www.ivifoundation.org).

The IVI Foundation wants to receive your comments on this specification. You can contact the Foundation through the web site at [www.ivifoundation.org](http://www.ivifoundation.org).

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# Introduction

In 1993, a group of leading VXI technology vendors formed the *VXIplug&play* Systems Alliance, which defined complete system frameworks that gave end-users “plug & play” interoperability at both the hardware and system software level. For more information about the alliance, refer to the *What Is VXIplug&play?* section of this document.

In 1997, a group of instrument vendors, software suppliers and end users formed the Interchangeable Virtual Instruments (IVI) Foundation, which defined a set of interchangeable instrument driver models built on *VXIplug&play*-compliant frameworks. 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. The foundation’s standards are built on the basic agreement and multivendor interoperability that *VXIplug&play* provides.

The *VXIplug&play* Systems Alliance merged with the IVI Foundation in 2003. The two organizations merged for several reasons:

- The *VXIplug&play* Systems Alliance was stable and mostly inactive; except for the VISA group, there were few changes to the *VXIplug&play* specifications.
- The IVI Foundation was a formal, legal nonprofit organization with strong funding.
- Because IVI standards are based on *VXIplug&play* standards, there was a natural fit between the two organizations and a commitment to *VXIplug&play* within the IVI Foundation.
- Many of the technical experts involved in *VXIplug&play* were also involved in the IVI Foundation. Merging the two organizations increased efficiency and leveraged technical working group activities.

## Changes to the *VXIplug&play* Charter Document and Specifications

Since the merger, most of the *VXIplug&play* Charter Document has remained intact. The charter, benefits, history, and guiding principles are maintained to provide historical information and future direction for *VXIplug&play* subcommittees within the IVI Foundation. The only changes were to remove the sections on contact and membership.

Although the *VXIplug&play* Systems Alliance no longer exists, most of the references within the *VXIplug&play* specifications still refer to it, rather than the IVI Foundation. This is because the specifications are based on the original *VXIplug&play* Systems Alliance goals, not the IVI Foundation goals. In each specification, only the contact, warranty, and trademark information have been updated to reference the IVI Foundation. All other references to the *VXIplug&play* Systems Alliance are unchanged.

**Note:** The IVI Foundation resolves any conflicts between the *VXIplug&play* Charter Document and the IVI Foundation Bylaws. Refer to the IVI Foundation Web site, [www.ivifoundation.org](http://www.ivifoundation.org), for the foundation’s bylaws, operating procedures, and membership information. *IVI-1.2: Operating Procedures* contains additional rules and practices on how the IVI Foundation conducts business.

## What Is *VXIplug&play*?

The *VXIplug&play* Systems Alliance is an organization whose members share a common commitment to end-user success with open, multivendor VXI systems. The alliance has 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 uses both formal and *de facto* standards to define complete system frameworks. These standard frameworks give end-users true “plug&play” interoperability at both the hardware and system software level.

### ***VXIplug&play* Hardware**

The goal of the *VXIplug&play* Systems Alliance is to improve ease of use and maintain VXI as a true, open multivendor architecture at the system level. As such, all VXI hardware that is compatible with the VXIbus Specifications is applicable to *VXIplug&play* frameworks, and vendors do not need to be members of the organization for their products to be compatible. Areas that will enhance hardware “plug&play” compatibility beyond the scope of the VXIbus specifications include consistent approaches for connectors; UUT interfacing and fixturing; instrument protocols for shared-memory communication; consistency in the use of optional VXI features such as backplane triggers, interrupts, subbus, and local bus; and common documentation approaches. In addition, a consistent approach for calibration could deliver major benefits to both vendors and end-users.

### ***VXIplug&play* System Software**

The alliance achieves “plug&play” interoperability for system software by working together to identify and promote standardized system software frameworks. Some elements of a system software framework include operating system, programming language, I/O drivers, instrument drivers, and higher-level application software tools. The alliance recognizes that many shared architectural elements exist in the market today, representing both an opportunity and a mutual responsibility. The alliance recognizes that several software packages are in use by thousands of end-users. The alliance has a commitment to maximize compatibility with the installed base.

## **Unifying Software Technologies**

Having the desire to encourage further commonality in software architecture, the alliance looks to the future and identifies key areas for further improvement and standardization. The alliance views standard instrument drivers, usable both interactively and programmatically, as a mandatory software component for every VXI instrument. In addition, with the increased use of key computer standards, such as dynamic link libraries (DLL), software packages can coexist in the same system and cooperate in exciting new ways.

Rather than limit software choices, the alliance believes that identifying standard software frameworks minimizes duplicated effort on shared architectural elements. This improves the quality and ease of use of the shared elements, and gives vendors an opportunity to focus on extending the scope of their unique added value. The alliance believes standard frameworks are the key to enabling a variety of software tools from multiple vendors to operate cooperatively in the same system. Just as in the Microsoft Windows environment, where framework standards give a tremendous variety of vendors the ability to produce interoperable software products with unique added value, standard frameworks in VXI benefit both the user and vendor communities.

## **Enhancing End-User Programming**

The alliance recognizes standard end-user programming languages such as C and Visual Basic, and standard operating systems such as Windows 2000, Windows XP, Windows Vista, and Windows 7 as important standard frameworks. For these end-users, as for system and software vendors, a robust, standardized I/O driver software foundation for long-term capability and backward compatibility is a must. The alliance has a guiding principle to maintain this commitment and maximize compatibility with the installed base in its future efforts and activities.

## **A Standard Software Foundation**

To achieve broad “plug&play” capability for multivendor system software tools, a unified I/O driver software architecture is required as a foundation. The *VXIplug&play* Systems Alliance defined the VISA (Virtual Instrument Software Architecture) I/O driver architecture to provide a unified foundation for all existing points of view as well as next-generation needs.

# ***VXIplug&play* Charter**

The *VXIplug&play* Systems Alliance is a natural complement to the VXIbus Consortium. The charter of the VXIbus Consortium is to specify a broad range of baseline technology. However, the VXIbus Consortium is not designed to be a forum for discussing end-user needs, system software, customer service, technical support, or actual applications. Nor does the VXIbus Consortium discuss, endorse or direct product implementation philosophies. The *VXIplug&play* Systems Alliance is a mechanism designed to help meet these industry needs.

The charter of the *VXIplug&play* Systems Alliance is to improve the effectiveness of VXI-based solutions by increasing ease of use and improving the interoperability of multivendor VXI systems. The focus of activity is the end-user of multivendor VXI systems, along with the products and services used by end-users today and in the future to develop, maintain, and support multivendor VXI systems over their life cycle. Through this charter, the alliance will keep the spirit of VXI as an open, multivendor standard alive. In addition, the alliance will improve interoperability and ease of use at the system level as well as the component level, while maintaining long-term compatibility with the installed base.

Because system software is a primary component in any system, and a key area of concern for end-users, system software architecture is a major focus for the *VXIplug&play* Systems Alliance's activities. Through its efforts, the alliance defines standard system architectures and endorses and promotes compatible products and services. The overall goal is to increase the success of both users and vendors of VXI-compatible hardware and software for the benefit of the entire instrumentation community.

# **VXI*plug&play* Benefits**

The benefits of an organization such as the VXI*plug&play* Systems Alliance are easy to understand and quantify. The key beneficiaries are the end-users of VXI technology, who realize reduced development costs and life-cycle costs for their VXI-based systems. VXI*plug&play* frameworks define the boundaries of overall system architectures more specifically than the baseline VXI and GPIB specifications. As a result, end-users can be confident that products and services from vendors that conform to VXI*plug&play* frameworks can be integrated more easily than products and services that lack a shared system-level framework for application and use.

Vendors who have products that conform to VXI*plug&play* frameworks benefit in that they have a more clearly defined application area driven by user input to guide the development and packaging of their products and services. In addition, they are able to more effectively promote and distribute their products and services so end-users can clearly understand their system-level value.

## **Implementation and Results**

The VXI*plug&play* Systems Alliance founding members are moving forward with this organization. Through meetings and working groups, both vendors and users discuss specific products and services – hardware and software, as well as application needs and experiences – to identify and take action to continuously improve common techniques, architectures, and standards. The members contact other interested parties and periodically hold organizational meetings to define details for implementing VXI*plug&play* action items. The VXI*plug&play* Systems Alliance makes public statements announcing new members; identifying, documenting, and promoting standard VXI*plug&play* frameworks; and educating users and cross-training vendors. For the latest information, contact the alliance as shown below.

# VXI*plug&play* Guiding Principles

The VXI*plug&play* Systems Alliance has identified 10 guiding principles to drive the activities of the alliance. These guiding principles represent the commitment of the member companies to each other and to end-users. The guiding principles are:

1. Maximize ease of use and performance
2. Maintain long-term compatibility with the installed base
3. Maintain multivendor open architectures
4. Maximize multiplatform capability
5. Maximize expandability and modularity in frameworks
6. Maximize software re-use
7. Standardize the use of system software elements
8. Treat instrument drivers as part of the instrument
9. Accommodate established standards, both *de facto* and formal
10. Maximize cooperative support of end-users

## **1. Maximize Ease of Use and Performance**

The primary focus of the *VXIplug&play* Systems Alliance is to increase ease of use for the end-user. Increased ease of use encompasses easier integration, which results in reduced development costs as well as ease of future use, which results in reduced maintenance and support costs over the life of the system. In some cases, meeting the ease-of-use objectives may require additional effort or expense on the part of vendors. These tradeoffs will be made to the benefit of end-users. In addition, *VXIplug&play* frameworks will place a premium on performance and identify performance tradeoffs when necessary.

## **2. Maintain Compatibility with the Installed Base**

The *VXIplug&play* Systems Alliance will maintain backward compatibility with existing products and the installed base of instrumentation users. End-users who build systems conforming to the *VXIplug&play* frameworks can rest assured that their investment will not be wasted in the future. This commitment extends not only to future users, but more importantly, to existing users of GPIB and VXI equipment and software listed in the “Core *VXIplug&play* Technologies” section of this document.

## **3. Maintain Multivendor Open Architectures**

The *VXIplug&play* Systems Alliance will define open, multivendor frameworks. *VXIplug&play* frameworks, for example, can use VXI and GPIB instruments from any vendor, regardless of whether or not the instrument is compatible with *VXIplug&play* frameworks. Defining an overall system framework will, in some cases, require that specific software requirements be identified and placed on particular components in order to guarantee ease of integration and interoperability for that particular system framework. A particular system software framework, for example, may use specific I/O driver software, instrument drivers, and soft panels that conform to that framework. Products and services that do not meet these requirements will not be promoted as compatible with that particular framework, but the requirements for compatibility will be clearly defined and the tools for compatibility will be open so that any user and/or vendor who desires to be compatible can understand the requirements and achieve compatibility.

## **4. Maximize Multiplatform Capability**

The *VXIplug&play* Systems Alliance will clearly define the computer platforms with which particular frameworks are compatible, and will maximize compatibility across as many platforms as possible in order to keep end-user options open for the host computer used in systems. The alliance will align its own efforts and standardization activities with those of the general computer marketplace to ensure long-term compatibility and maximize the flexibility and benefits of using general-purpose computers for instrumentation applications.

## **5. Maximize Expandability and Modularity in System Architectures**

VXI*plug&play* frameworks will be expandable and modular, providing a good-better-best capability so that end-users can expand and maintain their systems over their life cycle. One of the key benefits of VXI is its modularity and expandability. Unlike previous generation technologies, which forced users to buy more capability than needed today as protection for the future, the modular architecture of VXI gives users the opportunity to buy just enough capability for today, with inherent expandability for the future. The alliance will maintain the benefits of this modularity and expandability in its system-level frameworks.

## **6. Maximize Software Re-use**

The VXI*plug&play* Systems Alliance will identify guidelines and tools that maximize software re-use on the part of both vendors and end-users. Compatibility with the installed base is a very important component of this guideline from the viewpoint of end-users. From a vendor and product viewpoint, using software standards (both formal and *de facto*) that accommodate as many viewpoints as possible with a single unified standard is an important factor in this area. In addition, identifying and documenting the key elements in a defined framework will help to clarify the relationship between software components and identify the areas that affect software re-use.

## **7. Standardize the Use of System Software Elements**

The VXI*plug&play* Systems Alliance will identify and endorse common system software elements, including I/O drivers, operating systems, languages, instrument drivers, soft panels, and system software. The alliance will identify key software technologies and standards, both formal and *de facto*, in order to clearly and completely define overall frameworks from top to bottom. Relevant technologies and standards that emerge in the future, either as formal standards from a standards organization, or vendor-specific approaches that are openly documented and relevant to multivendor interoperability, will be accommodated to maximize compatibility with the installed base and conform to other VXI*plug&play* guiding principles.

## **8. Treat Instrument Drivers as Part of the Instrument**

VXI*plug&play* frameworks use ready-to-go, turnkey instrument drivers as a key component of the system, whether the end-user programs with a standard programming language or uses an application software package. Instrument drivers are one of the highest value-added components of a system, dramatically increasing ease of use and reducing development and maintenance costs for end-users. Instruments that conform to VXI*plug&play* frameworks will have instrument drivers that are fully tested, documented, open, and delivered in source code when possible. The alliance develops common standards and practices for the development, architecture, distribution, and support of multivendor instrument drivers.

These instrument drivers will usually be developed by the instrument vendor, but this is not a requirement for compatibility. *VXIplug&play* instrument drivers are open and well documented. The tools and techniques used to develop the instrument drivers are widely available to any user or vendor. Thus, instrument drivers may be developed by the instrument vendor, another vendor or third party, or the end-user. In addition, it is not necessary for instrument vendors to be part of the *VXIplug&play* Systems Alliance for their instruments to be compatible with *VXIplug&play* frameworks.

## **9. Accommodate Established Standards, Both *de facto* and Formal**

*VXIplug&play* frameworks will use established standards where possible. These standards can be either formal or *de facto*. Features of a particular product line, for example, that are openly documented and critical to the operation of particular instruments in a multivendor system will be accommodated in *VXIplug&play* frameworks in a way that is compatible with the installed base. In addition, the alliance will define additional standards for technology, products, and services when needed to achieve the goals of ease of use, reduced development and maintenance costs, and multivendor compatibility.

## **10. Maximize Cooperative Support of End-Users**

The *VXIplug&play* Systems Alliance will increase the level of cooperation among vendors in supporting end-users. The alliance will identify key factors to achieve this goal, such as cross training of technical support personnel, regular technical support and/or interoperability meetings, shared contact lists and customer progress reports, and cooperative hot lines. The alliance will implement programs among members to ensure success and to provide a noticeable benefit to end-users. In addition, the alliance will have an active user group mechanism whereby end-users can also become intimately involved in activities.

# Core *VXIplug&play* Technologies

Some of the core technologies currently embodied in the *VXIplug&play* System Alliance's system architecture philosophy are listed below. These core technologies are reflected in *VXIplug&play* framework definitions.

- VXIbus mainframes and fixturing
- VXIbus instruments and VME modules
- High-speed VXI transfers (shared memory, Fast Data Channel)
- GPIB (IEEE 488.1 and 488.2) instruments
- High-speed GPIB transfers (HS488)
- Industry-standard computers
- Embedded VXI computers
- MXIbus interfaces and extenders
- Windows 2000, Windows XP, Windows Vista 32, Windows Vista 64, and Windows 7 operating systems
- VISA I/O interface software
- LabVIEW and LabWindows/CVI instrument drivers in source code
- Executable Instrument Soft Front Panels
- ANSI C, G, and Visual Basic programming languages
- DLL and other computer standards for communicating with other open software products and environments

# Future Direction and Technologies

In the future, new technologies and standards will be accommodated by *VXIplug&play* frameworks. Some of these are listed below. These future technologies will be also reflected in *VXIplug&play* framework definitions.

- Next-generation personal computers and buses
- Next-generation operating systems and languages

## *VXIplug&play* History and Rationale

In 1987, the VXIbus Consortium was formed with a charter of producing open specifications for a multivendor instrument-on-a-card standard. The tremendous success of VXI is a testament to the vision, commitment, cooperation, and technical expertise of the member individuals and companies of the VXIbus Consortium, as well as other parties who helped develop and continuously improve the baseline VXIbus specifications.

The VXIbus specifications have proven to be robust and highly effective in defining a common baseline for instrument-on-a-card technology. One of the key reasons for the success of VXI was the VXIbus Consortium's goal and its ultimate success in defining and standardizing a baseline technology that can stand the test of time over a period of many decades. To achieve this, the authors of the VXIbus specifications were careful to define only those aspects that were required for baseline interoperability of components, so they would not place unnecessary restrictions that would inadvertently narrow the scope of VXI system-level technology and applications.

VXI-based systems can take advantage of a wide variety of technologies and products, ranging from low-cost A-size hardware components to high-performance D-size components. In addition, while the Consortium members diligently standardized backplane communication protocols and software procedures required for orderly system initialization, they did not make assumptions or dictate fixed requirements for the overall system software architecture. Because of this foresight, VXI has been adopted for new systems and integrated into existing systems by a wide range of hardware and software vendors and users.

While VXI has enjoyed tremendous success and growth in a wide range of commercial and military applications, many users of VXI systems have expressed their desire for more precise definitions regarding the interoperability of more VXI-based instrumentation system components. Specifically, system software architecture has been an area of great interest for standardization on the part of end-users. These users do not want additional standardization to limit the overall range of application for VXI technology, but rather, need more guidelines for increasing multivendor VXI technology ease of use in their particular application areas. Although the VXIbus Consortium has heard these views expressed at numerous user group meetings, it has not achieved much progress in this area.

The lack of progress on narrower, application-specific standardization of overall VXI system architecture components, such as system software and UUT fixturing and interfacing, has not been due to a lack of willingness on the part of Consortium members. Rather, it has been due to a conflict with the original charter of the organization and honest differences in philosophies and long-term visions on the needs of VXI in the future. Standardization efforts are most successful when the technology standardized is well understood and the opinions and views about what to standardize are agreed upon by all participants in the effort. Such agreement has proven to be especially difficult in the area of system software.

In September, 1992, National Instruments, Tektronix, and Sun Microsystems announced the formation of the OMS (Open Measurement Systems) Alliance. The OMS Alliance was made possible because the member parties came to the realization that they agreed on all of the components of an overall system architecture for standardized test and measurement systems. With this shared philosophy, the participants could produce, promote, package, distribute, and support products and services that were built to conform to the standardized framework embodied in the OMS definition. The success of OMS is a testament to the value of cooperation among product vendors who wish to establish more specific definitions regarding the interoperability of their products and services.

The OMS participants received very positive feedback on the OMS concept from both users and vendors of VXI and GPIB instruments and equipment. This high level of interest, in the minds of the OMS participants, proved the value of identifying and sharing common business and product philosophies and communicating these shared philosophies to end users. End-users, in the case of OMS, were very receptive to the idea of multiple vendors more clearly defining the degree of product and service interoperability and the commonality of future product direction. Other vendors, in response to the success of OMS, also realized the value of clearly identifying to their prospective customers how their products and services relate to those of other vendors in a multivendor system.

The magnitude of the feedback and the positive reception to the OMS concept led to the development of the *VXIplug&play* Systems Alliance. OMS represented the first experiment in a unique new concept. The *VXIplug&play* Systems Alliance, therefore, represents the next step in building on the success of this concept. The *VXIplug&play* Systems Alliance can be viewed as an extension of OMS – an opening of the concept to accommodate the increasing number of vendors and users who also share common philosophies and objectives for VXI-based instrumentation systems.