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Vortex OpenSplice

National Instruments LabVIEW™ Software
DDS Binding

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1. Background

National Instruments LabVIEW™ software

Laboratory Virtual Instrument Engineering Workbench (LabVIEW) is a system-design platform and development environment for a visual programming language from National Instruments.

LabVIEW software is commonly used for data acquisition, instrument control, and industrial automation which makes it extensively used within Avionics, Comms, Radar, Automotive and Oil & Gas applications.

LabVIEW software provides rapid prototyping and scalability through data driven programming, whereby:

- Blocks (pieces of code) are “functions” or logic statements, while loops
- A block is executed as soon as all its inputs are available
- All blocks with their inputs available at the same time will be run in parallel

Every LabVIEW Virtual Instrument (VI), consists of a block diagram and a front panel.

Benefits of LabVIEW software:

- Extensive support for interfacing to devices
- LabVIEW software includes a compiler that produces native code for the CPU platform
- There are a large number of libraries with functions for data acquisition, signal generation, mathematics, statistics, signal conditioning, analysis, etc.
- It is very easy to program multiple tasks that are performed in parallel which is very beneficial for processes like test sequencing, data recording and hardware interfacing

DDS

The Object Management Group®'s (OMG®) Data-Distribution Service™ (DDS™) standard is a data-centric publish-and-subscribe technology that emerged from the Aerospace and Defense community to address the data distribution requirements of mission-critical systems. It enables scalable, real-time, reliable, high performance and interoperable data exchanges between publishers and subscribers. DDS is designed to address the needs of mission and business-critical applications like financial trading, air traffic control, smart grid management, and other big data applications. It is being increasingly used in a wide range of Industrial Internet applications.

The DDS specification defines:

- A Data Centric Publish Subscribe (DCPS) layer providing a set of APIs that present a coherent set of standardized "profiles" targeting real-time information-availability for domains ranging from small-scale embedded control systems right up to large-scale enterprise information management systems.
- A DDS Interoperability Wire Protocol (DDSI)
- Extensible and Dynamic Topic Types, that define how Topic data types can be extended dynamically while ensuring application portability and interoperability.

DDS is both language and OS independent. Using standardized APIs helps ensure that DDS applications can be ported easily between different vendor's implementations.

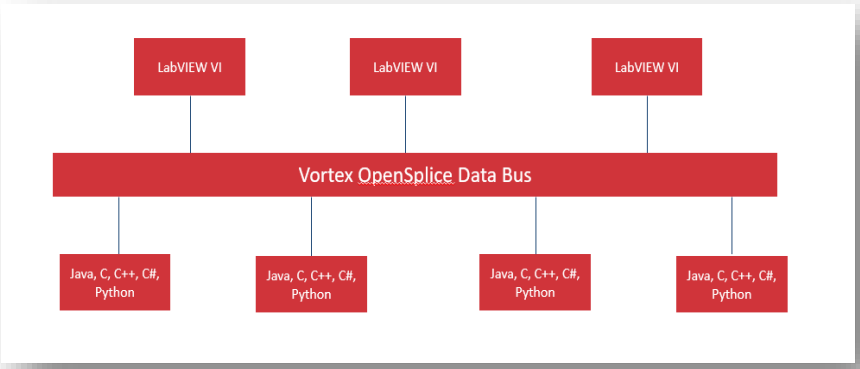
DDS also specifies a wire protocol, the DDS Interoperability Wire Protocol, referred to as DDSI. A wire-level protocol refers to the mechanism for transmitting data from point-to-point. A wire protocol is needed if more than one application has to interoperate. In contrast to protocols at the transport level (like TCP or UDP), the term wire-protocol is used to describe a common way to represent information at the application level. All DDS implementations complying with DDSI will interoperate. The protocol also supports automatic "Discovery" that allows DDS participants to declare the information that they can provide or what data they would like to receive, in terms of topic, type and QoS. The protocol will automatically connect appropriate publishers to subscribers. This significantly simplifies the process of configuring systems with many nodes and many devices exchanging data.

Vortex OpenSplice v6.9 includes a DDS binding for National Instruments LabVIEW software

This enables LabVIEW 2017 applications to connect to a DDS domain and exchange data with other LabVIEW applications and / or native DDS applications. The binding is delivered in the form of a LabVIEW VI Package (located in the tools / LabVIEW subdirectory of a Vortex OpenSplice installation). Once installed, the VI Package enables the creation of DDS applications, including the compilation of IDL into LabVIEW virtual instruments and controls.

The LabVIEW binding is available on Vortex OpenSplice Windows and Linux builds compatible with LabVIEW 2017.

2. Why LabVIEW Software DDS Binding is a Big Deal



Vortex OpenSplice provides fast, secure and interoperable data communications infrastructure for LabVIEW software. It can be used to distribute real-time data between LabVIEW Virtual Instruments as well as between LabVIEW software and other applications, such as those written in C, C++, C#, Java and Python. It allows you to reliably scale systems to hundreds or even thousands of applications, distributed across local and wide-area networks.

LabVIEW applications can communicate via a publish / subscribe model. Automatic discovery matches publishers and subscribers, routing data accordingly. This significantly reduces the amount of custom code required to support system communications.

It is possible to create DDS applications using graphical drag and drop blocks in LabVIEW software allowing creation of complex systems without coding. DDS applications made with the Vortex OpenSplice LabVIEW VI package can seamlessly communicate with C, C++, C#, Java and Python applications developed using Vortex OpenSplice DDS. In addition, because Vortex OpenSplice complies with the DDS standard, LabVIEW applications based on this toolkit can interoperate with applications developed using any DDS implementation that complies with the DDS-RTPS wire interoperability protocol.

Summary of benefits:

- Seamless Integration between LabVIEW software and other applications implemented in C, C++, C#, Java, Python
- Scalable peer-to-peer data communication
- Dynamic peer discovery
- Robust security with authentication, encryption, and per-topic access control
- Ability to fine-tune application behavior, without coding. through Quality of Service parameters
- Windows and Linux OS support

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