

# **OPC from Factory Floor Embedded Controllers to Enterprise System-Level Applications**

Marc Serughetti  
Director of Marketing, Wind River

A recent study, developed by ARC for the OPC Foundation, indicated “OPC Technology is now the preferred method of connectivity for 78% of Production Management and MES applications, 75% of HMI/SCADA applications, 68% of DCS/PLC applications, and 53% of ERP/Enterprise system-level applications. ARC expects these trends to continue to grow over the next five years, increasing the percentages above and also expanding OPC as a preferred connectivity to the Subsystem, Component, and Sensor levels as well.” However extending OPC deeper on the factory floor isn’t without challenges. Making OPC available to factory floor embedded real-time devices often requires a cumbersome device layout, resulting in increased costs. This paper presents an approach to bring OPC to embedded real-time devices while limiting additional costs.

### OPC and its benefits

OPC provides a standardized communication mechanism for connecting industrial applications and business-level applications with factory floor equipment traditionally found in the Industrial Automation market. The OPC specification is managed by the OPC foundation

([www.opcfoundation.org](http://www.opcfoundation.org)). Its objective is to ensure interoperability between different computers used on the factory floor and at the monitoring and enterprise level through creation and maintenance of open standards specifications. See Figure 1.

Several specifications are provided for OPC; the most common current specifications are:

- **OPC Data Access:** These interfaces enable an OPC Server and OPC Client to communicate. The OPC Server allows an OPC Client to access information it contains such as the server, the group, and the items.
- **OPC Alarms and Events:** These interfaces provide the mechanisms for OPC Clients to receive information regarding the specified events and alarm conditions and enable an OPC Client to determine the events, conditions, and their current status for a specific OPC Server.

The OPC communication mechanism is based on technologies such as OLE (Object Linking and Embedding), COM (Component Object Model), and DCOM (Distributed COM). COM provides interfaces and inter-components communication, and DCOM extends COM to work over a network.

Traditional proprietary systems talk different languages to transfer data, which can cause inconsistencies among different vendors. The creation of hardware features not universally supported and frequent hardware upgrades can lead to incompatibilities in drivers and access conflicts. The OPC specification enables clients and servers from different vendors to talk the same standard language, providing an OPC vendor a single version of their drivers for multiple OPC applications, increased connectivity and interoperability among vendors’ specific applications, and easy access to subsystem data.

### OPC current limitations for the factory floor

Although OPC offers many benefits, its extension has been limited for embedded real-time devices on the factory floor. OPC is based on the DCOM interface, traditionally supported on a Windows platform. However, Windows platforms are not designed for embedded factory floor devices requiring real-time operation. DCOM proprietary aspect and lack of scalability for embedded real-time devices has required additional hardware and complexity for interoperability

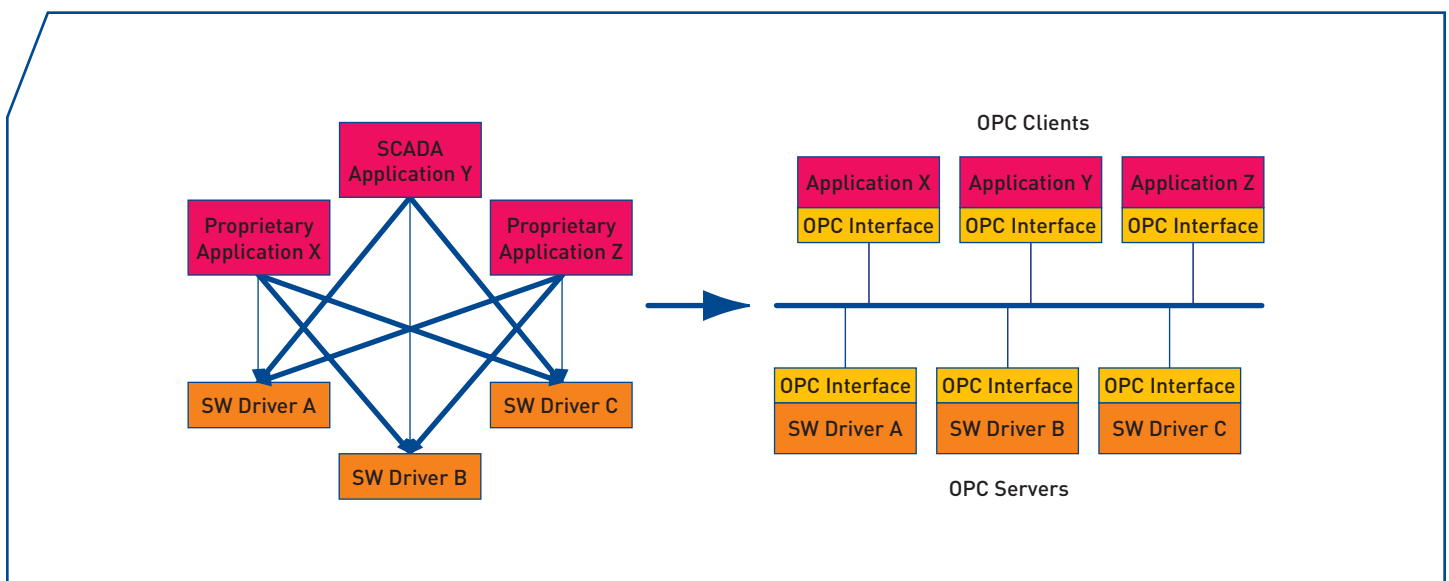


Figure 1: Standardization of Interfaces through OPC

resulting in increasing development, deployment, and support costs. See Figure 2.

**Bringing OPC to factory floor devices**

In order to bring OPC to the factory floor, the OPC software needs to be tailored for the requirements of embedded devices. This includes the fact that the foundation software such as DCOM used by the OPC interfaces should be available as well.

Requirements for implementation include:

- **Footprint:** Embedded factory floor devices often have strict memory requirements. Providing scalable software components will ensure that developers can optimize the use of available resources.
- **Performance:** Embedded real-time devices have time constraints. Providing optimized software and drivers for OPC will enable developers to integrate OPC interfaces within their embedded real-time factory floor devices.
- **Integration:** More and more embedded real-time devices use commercial off-the-shelf real-time operating systems (RTOS). Ensuring that the foundation software and the OPC interfaces are integrated with an RTOS will accelerate the implementation of the factory floor devices requiring an OPC interface.
- **Interoperability:** Embedded real-time devices may use a wide variety of foundation software. Including file systems, networking protocols for controls, networking protocols for local connectivity, graphics libraries, I/O drivers, etc. As a result, it is key to ensure the integration on the devices of the OPC interface with other resident software.

Bringing OPC to the factory floor devices will lead to the simplification of the network layout as well as to reduced costs. OPC inter-

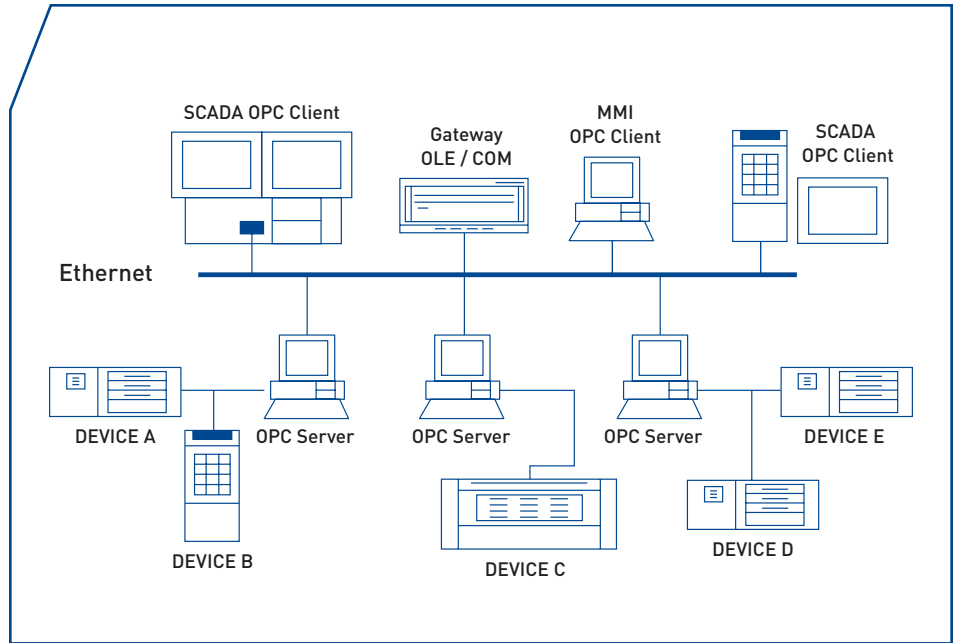


Figure 2: Traditional OPC Layout

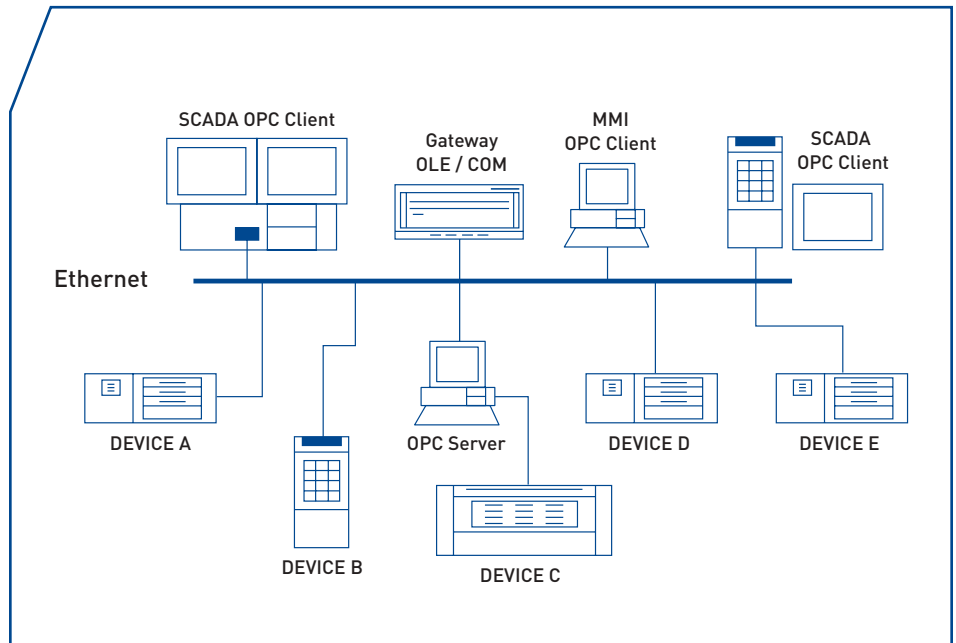


Figure 3: OPC Layout with OPC Interfaces Available from Devices

faces and drivers being available directly on the embedded real-time device provide an option to the developers either to directly access this data or to continue using a gateway OPC Server, depending on their specific design requirements. Figure 3 presents an example where a mixed approach is used and where hardware needs are reduced. In this approach, devices automatically provide an OPC interface.

**Implementation of an OPC Server for embedded real-time devices**

Wind River is the leader of embedded software solutions and services. In the Industrial Automation market, Wind River technologies and services are used in many devices, ranging from numerical controllers, programmable logic controllers, and distributed control systems to instrumentation and monitoring devices.

Wind River has developed two technology lines based on its **VxWorks®** RTOS, which enable embedded real-time device developers to offer OPC interfaces in their design:

- **WIND®NET DCOM** is an implementation of Microsoft's® DCOM for **VxWorks**. It is specifically targeted at embedded real-time devices. **WIND NET DCOM** provides scalability and footprint to meet developer's requirements.
- **WIND®NET OPC** provides an implementation of the Data Access Server and the Alarms and Events specification specifically targeted at embedded real-time devices. It also provides a sample client tool integrated with Wind River's **TORNADO®** Integrated Development Environment (IDE). The sample client tool can be used as a development tool to debug and test an OPC Server implementation.

**Integration and interoperability**

**WIND RIVER® PLATFORM FOR INDUSTRIAL AUTOMATION (PLATFORM IA)** offers a comprehensive and totally integrated approach to product development. By combining leading-edge runtime technologies with first-rate development tools, these standardized platforms improve and accelerate your project from the beginning. They're well proven as an effective and reliable foundation for success.

**PLATFORM IA** provides many benefits to its users, including:

- Standardization, beyond the RTOS, which eliminates wasting valuable time and resources re-creating start-up fundamentals for every project and allows developers to focus more on product differentiation and enhancement and to get you to market faster, with less expense.

- Integrates completely with today's preferred OSs, tools, networking, connectivity, and device-management capabilities and is fully tested, fully integrated, and fully supported for utmost reliability and greatly reduced risk.
- Is part of a total offering that includes expert training, services, and support from Wind River, the worldwide leader in embedded software and services; incorporates a licensing business model that makes it easy to engage Wind River as a partner; and is suitably flexible for today's challenging business environment.

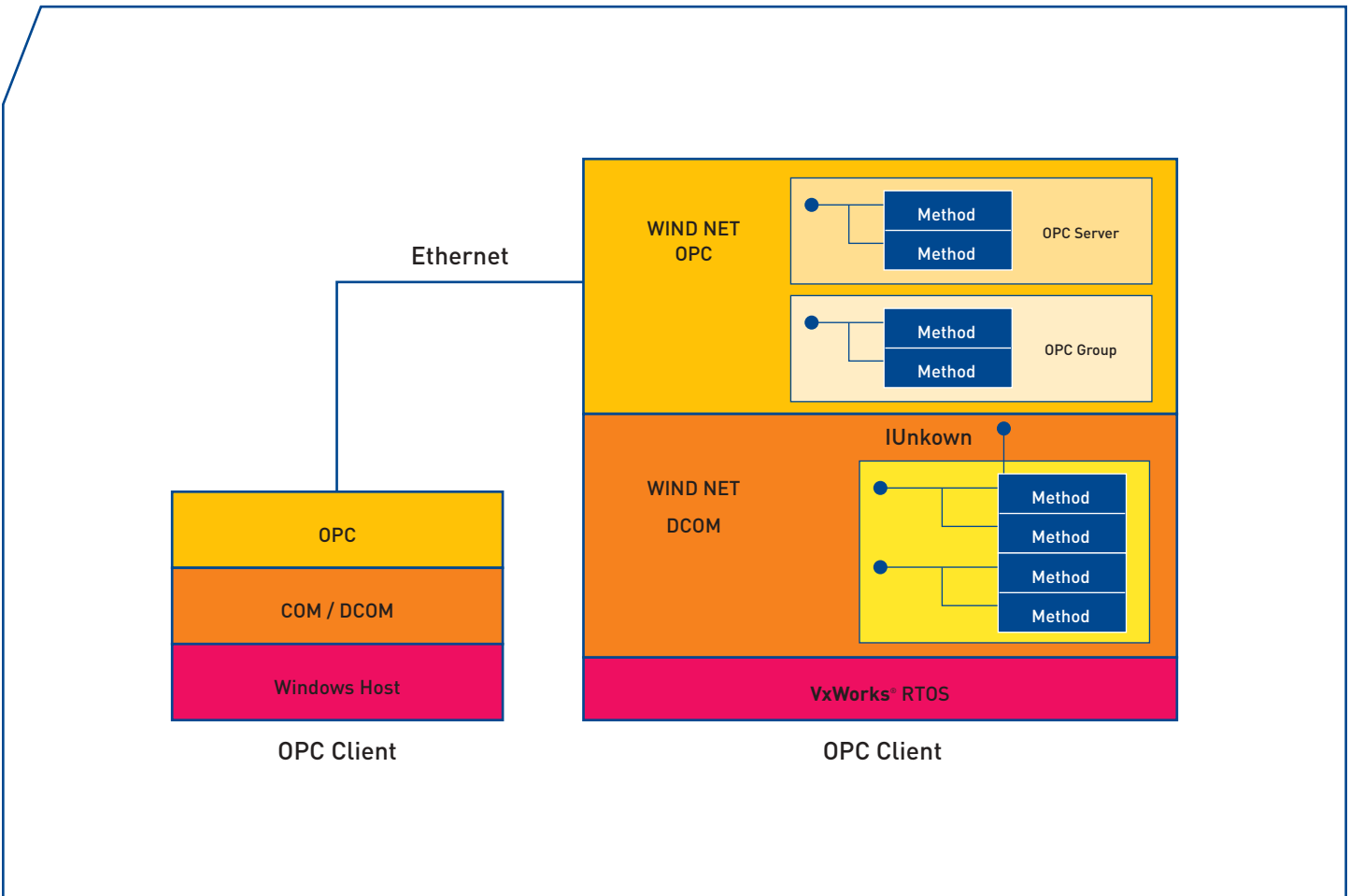


Figure 4: **WIND®NET DCOM** and **WIND®NET OPC**

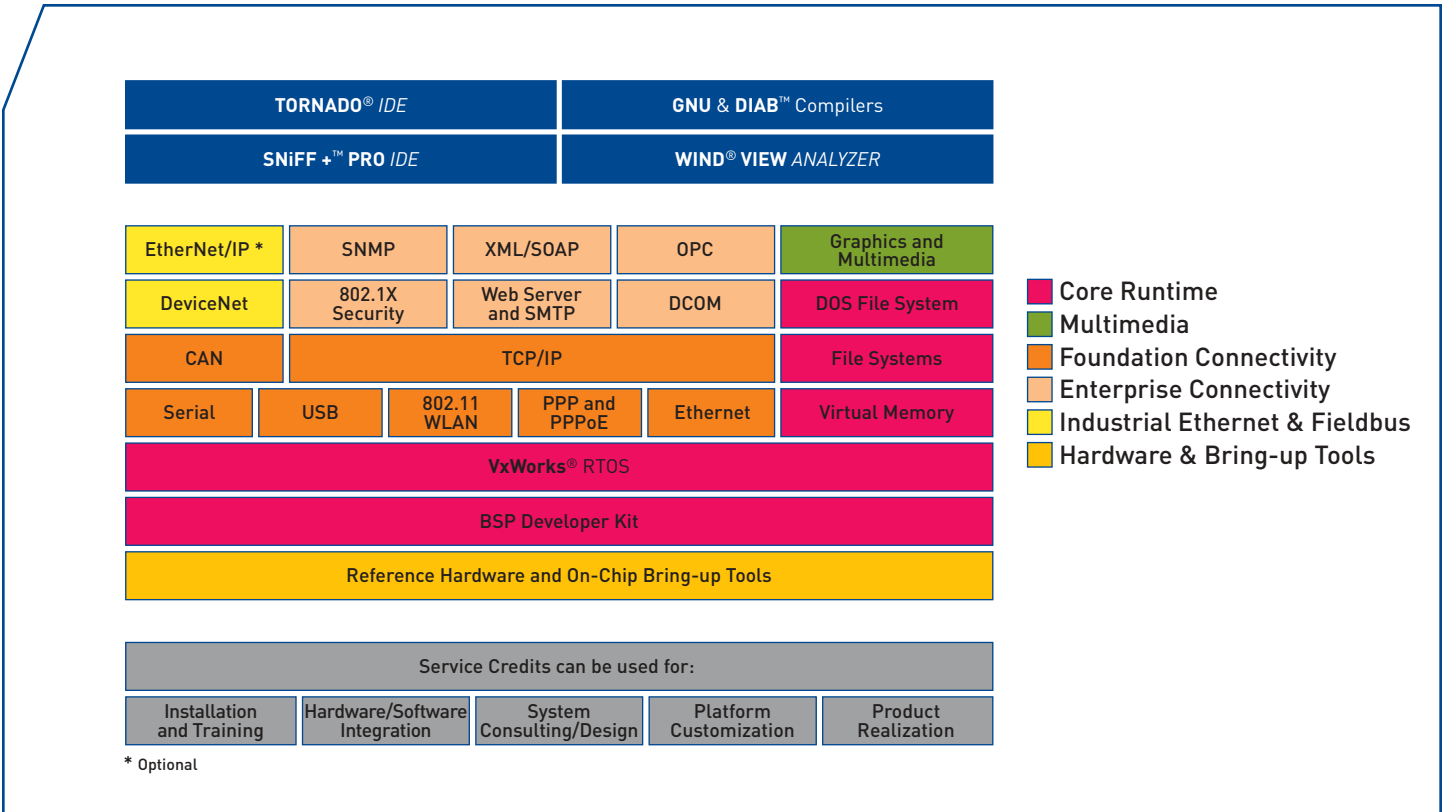


Figure 5: WIND RIVER<sup>®</sup> PLATFORM FOR INDUSTRIAL AUTOMATION

**PLATFORM IA** includes technology enabling enterprise connectivity, control connectivity, and local connectivity. **WIND NET DCOM** and **WIND NET OPC** are an integral part of **PLATFORM IA** and are integrated and interoperable with other components such as Ethernet/IP, DeviceNet, CAN, and the **VxWorks** RTOS. In addition, **PLATFORM IA** already supports the XML and SOAP foundation software required to develop the next generation of OPC solution. As a result, developers of the next generation of embedded factory floor devices can already

start planning their next-generation devices with Web services with hardware cost savings in mind. An architecture diagram for **PLATFORM IA** is presented in Figure 5.



**Wind River Worldwide Headquarters**  
 500 Wind River Way  
 Alameda, CA 94501 USA  
 Toll free 1-800-545-WIND  
 Phone 1-510-748-4100  
 Fax 1-510-749-2010  
 Inquiries@windriver.com  
 Nasdaq: WIND

For additional contact information, please see our Web site at [www.windriver.com](http://www.windriver.com).

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