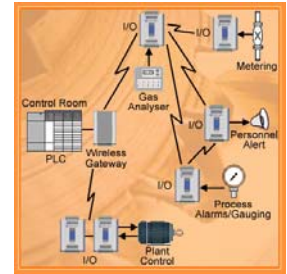


# VDC Research Group Industrial Automation and Control Practice

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## *Executive Brief*

# ***GLOBAL MARKET DEMAND AND USER REQUIREMENTS FOR INDUSTRIAL DISTRIBUTED/REMOTE/I/O***

*Fifth Edition*

*Prepared by:*

*James K. Taylor, Director  
Ladd Bodem, Director*

*Industrial Automation and Control Practice  
VDC Research Group  
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## INTRODUCTION

Over the past spring and summer, VDC Research Group (VDC) conducted its fifth study of the worldwide market for distributed/remote input & output (I/O) products used with distributed control systems (DCSs), personal computer (PC)-based control systems, and programmable logic controller (PLC) systems. I/O connects field devices, such as sensors and actuators, to controllers. I/O can exist either local at the controllers with hardwiring to devices, or distributed (remote) from the controller and connected to it via a bus or network.

The following are some of the more significant findings relative to markets for the distributed/ remote I/O products contained in the most recently completed study.

## ONGOING TREND TO REMOTING I/O

The current study indicated an interesting trend in local I/O vs. remote I/O. In our user survey, we found that currently local I/O accounts for the majority of connections for DCS, PC-based control system and PLC system applications. Users also stated that about 54% of the current I/O connections are local at the controllers in DCS applications, about 52% for PC-based control applications, and 56% for PLC system applications.

For all three product classes, we uncovered a shift away from the use of local I/O and toward greater use of distributed/remote I/O as well as direct embedding of I/O circuits in devices.

Remote I/O offers several advantages over local I/O. Remote I/O reduces the majority of the point-to-point hard wiring, which is both expensive to install, difficult to troubleshoot, and hard to modify. This allows for easier add-ons, changes and removal of functions. This is most valuable where changes or expansions are frequent and expensive.

Among users in our survey, it is expected that about 50% of the I/O will be connected through distributed/remote I/O products for DCS applications five years from now, with expectations of 45% for PC-based control system applications, and 49% for PLC systems.

The I/O share expectations for direct connectivity by devices with embedded interface circuits are about 10% for DCS applications, 14% for PC-based control applications, and 9% for PLC system applications.

Displacement of local I/O provides growth for the distributed/remote I/O product market. However, the expanding use of devices with bus/network embedded interface circuits will reduce this growth somewhat.

## MARKET SIZE, SEGMENTATION AND FORECASTS

### Worldwide Market

Worldwide 2008 shipments of distributed/remote I/O for industrial markets are estimated at \$US 4,288.5 million and are forecast to grow at a compound annual growth rate (CAGR) of 8% to \$US 6,308.9 million in 2010. Estimated shipment segmentation by product classes is as follows:

<u>For Applications With:</u>	<u>In 2008</u>
Programmable Logic Controller Systems	56.8%
Distributed Control Systems	31.9%
Personal Computer-Based Control Systems	<u>11.3%</u>
	100.0%

The market for distributed/remote I/O for use with PC-based control systems continues to achieve the highest growth rate and is forecast to remain so through 2013. The major factor driving this growth is the displacement of DCSs and PLCs in various applications. The market size, however, for PC-based control systems is smaller than the other product types studied and is forecast to remain so through 2013. Much of the hype surrounding the growth rates of PC-based control systems has not come to pass, and the future displacement rates are not expected to be as pronounced as some previously predicted. Both PC-based control systems and PLCs are growing at the expense of DCSs. One reason PLCs have continued to grow and to somewhat stunt the growth of PC-based control systems is the increasing intelligence provided in PLCs.

Other factors influencing the forecasts in this report include:

- The adoption of distributed/remote I/O in the developing economies of China, India and Latin America; and
- Relatively strong growth expectations in chemical, electric power, food & beverage, petroleum & gas, and water/wastewater industry applications.

Average selling prices are forecast to decline for all three product classes. However, price declines are expected to be limited due to the rising prices of raw materials such as copper, and the increasing price of fuel which is driving up the cost of operations and shipping.

### Regional Markets

The EMEA region (Europe, Middle East and Africa) has the largest consuming geographic market for distributed/remote I/O. North America accounts for the second largest share, and the Asia-Pacific region for the third largest. Latin America (Mexico, Central and South America) represents a relatively small share of the market.

The EMEA market is expected to have the lowest forecast growth rate through 2013 for all three product categories. The majority of shipments in this region are to markets in Europe which are the most mature in terms of advanced factory automation and therefore exhibit lower growth rates.

Significant double-digit shipment growth rates are forecast for all three product categories to Latin American markets. The second highest growth rates for all three are forecast for shipments to Asia-Pacific markets, with the third highest being to North American markets.

### **Application Markets**

The majority of 2008 worldwide shipments for use with DCSs are for end-user applications, while the largest shares of shipments for use with PC-based control systems and PLC systems are for OEM and system integrator applications. Overall, there is a slight shipment share trend expected toward OEM/system integrator applications. This trend toward greater implementation of distributed/ remote I/O by OEMs and systems integrators reflects the outsourcing of new designs and retrofits of controls by end users as they look to cut back on engineering staff and concentrate on their core operations. In addition, with the increasing sophistication of controls, many end-user engineering and implementation staffs lack the needed expertise to design and implement solutions.

## **PRODUCT FEATURES AND CHARACTERISTICS**

### **Control Buses/Networks**

The following are the leading bus/network interfaces for distributed/remote I/O in order of estimated 2008 worldwide shipment rankings for all three products categories combined:

1. Profibus DP;
2. DeviceNet;
3. Modbus TCP;
4. Ethernet/IP; and
5. Foundation Fieldbus H1.

One of the most significant trends related to bus/network connectivity remains the ongoing shifts to Ethernet networks. Another major trend is the displacement of proprietary buses/networks by open buses/networks in general. Among the Ethernet networks used with dedicated application protocols, the largest worldwide shipment share of distributed/remote I/O is for those with connectivity to Modbus TCP. Others include Ethernet/IP and PROFINET.

### **Safety Buses/Networks and I/O**

Safety buses/networks are used with safety control and safety instrumented systems that provide monitoring and control to prevent dangerous events from occurring due to equipment failures. These most typically actuate emergency shutdown devices and shutdown sequences. Safety systems are governed by standards with certification requirements for specified levels of safety. Most prominent among these standards are IEC 61508, and IEC 61511. Needless to say, the safety systems must have high reliability and availability.

It is estimated that shipments of distributed/remote I/O having connectivity to safety buses/networks for use in safety controls and safety instrumented systems will account for under 5% of worldwide shipments in 2008. The share is expected to reach 9% in 2013.

Most of these products are for use in safety PLC system applications. The strong development and promotion of safety PLCs (both stand-alone and integrated with machine/equipment controllers) and associated safety buses/networks by suppliers accounts for the high shipment shares of PLC systems for equipment and machinery.

Safety buses/networks currently in use with distributed/remote I/O include: AS-I Safety at Work, DeviceNet Safety, PROFIsafe, Ethernet/IP Safety, and PROFINET Safety.

The shift to Ethernet-based networks is also occurring in the safety bus/network market. In particular market share gains are expected for Ethernet/IP Safety and PROFINET Safety.

### **Mounting and Packaging**

DIN rail-mounted products account for the largest share of the worldwide distributed/ remote I/O markets for all product classes. DIN rail-mounting offers easy installation and maintenance, and does not occupy a lot of space – making it an attractive choice.

On-machinery mounting accounts for the second largest shipment shares for those used with PC-based control systems and PLC systems. The popularity of this mounting configuration is due to the ongoing trend to distributed controls. By locating the I/O modules directly on the machines, users can save wiring costs and have more flexibility with floor plan design. There is a relatively small share of on-machinery mounting for use with DCSs because of the propensity of use in process controls where field devices are usually more dispersed.

### **USER REQUIREMENTS**

Users (end users, OEMs, systems integrators, etc.) who purchase and specify distributed/remote I/O products were asked about their requirements through interviews and a Web survey. The following summarizes some of the findings.

#### **Product Selection Criteria**

For each, product reliability was identified most often as an important factor for product selection. Compatibility with existing/other systems and/or chosen controllers was the second most identified. This finding is similar to that found in our previous study conducted in 2006, although compatibility had the edge over reliability at the time.

#### **Non-Product Selection Criteria**

The majority cited application/technical assistance and customer support among their most important non-product selection criterion. These were cited by more users than price. This demonstrates that support and service can be an effective competitive differentiator and can be used to counter price objections. However, many more criteria also were cited by significant shares of the users, which would indicate that proper market segmentation and positioning beyond product features would yield additional growth.

## Maintenance Needs

By far the largest share of users indicated a strong preference for the inclusion of self-diagnostic capabilities, easier-to-use diagnostics, and better, more detailed documentation. Users also had a number of more feature-specific recommendations, but on the whole seek products that could identify their problems and documentation that helps them take action to correct issues that arise.

Distributed/remote I/O hot swapping was considered very important the most by DCS users, followed by users of PLC systems. Nearly half the PC-based control system users identified hot swapping as a useful but not critical feature. Users agree that hot swapping is imperative for applications where extended reliability/uptime is needed. For many applications, however, users identified cases where shutting down operations is relatively inexpensive and convenient.

## Converter Resolution

A trend toward higher maximum data converter resolution requirements is expected for all product classes, with users shifting away from products with 12-bit resolution toward 16-bit resolution. In some cases, shifts to even higher maximum resolution products are expected. Higher resolution provides users with greater accuracy and dynamic range, but the actual need for such resolution may actually be lower than the responses indicate since newer products may offer higher resolution at the same price level.

## Software Requirements

Users most identified reliability as the key software selection criterion for both DCS and PC-based control applications. Compatibility with other software and systems was the most identified requirement for PLC system applications, followed by reliability. Compatibility with other software and systems was the second most identified criterion for DCS and PC-based control applications.

The usage of programming languages for implementing distributed/remote I/O networks was found to be different for the three classes of controllers:

- Among the users of products for DCS applications, the largest percentage of respondents identified IEC 61131-3 Function Block Diagram. Compared to findings in our prior 2006 study, the share using IEC 61131-3 Function Block Diagram is much higher. In addition, the share using proprietary programming languages is one-half of the share found in our 2006 study;
- Among users for PC-based applications, the largest percentage of respondents identified Visual Basic, followed closely by C++. These were also the most identified in our prior study. LabView was identified by 33% of the users in this study, versus only 14% in the prior study. However, 16% cited use of Basic in this study, versus 26% in the prior study; and
- The largest shares of users for PLC applications cited specifically IEC 61131-3 Ladder Logic, with the second largest share identifying ladder logic in general. These were also the most identified programming languages in the prior study.

Hardware device vendors were the most identified source of software drivers for implementation of distributed/remote I/O for all three product classes. The largest share indicating they develop software drivers themselves were for PC-based control applications. However, for DCS and PLC system applications, third-party software vendors were the second most identified source of drivers.

The largest shift from the prior study was a decline in the share of users for PC-based control system applications obtaining software drivers from third-party software vendors.

## **CHANNELS OF DISTRIBUTION**

### **Sales Organizations**

The majority of worldwide sales for each of the product classes are by company field sales personnel. Manufacturers' representatives/agents account for the second largest shares for the products used with distributed control systems, and PC-based control systems. However, online orders account for the second largest share for the products used with PLC systems. The major reason is that the majority of these product sales by Siemens are over the Internet.

### **Customer Classes**

End users account for the largest share of worldwide distributed/remote I/O sales for product used with DCSs while distributors account for the largest shares of those used with PC-based control systems and PLC systems.

## **VENDOR ANALYSIS**

The estimated overall worldwide market leaders in distributed/remote I/O shipments for DCS, PC-based control system, and PLC system applications combined are:

1. Siemens;
2. Rockwell Automation;
3. ABB;
4. GE Fanuc Automation; and
5. Emerson Process Management.

## ABOUT THE STUDY

VDC Research Group's market study, *Global Market Demand and User Requirements for Industrial Distributed/Remote I/O, Fifth Edition*, provides market size, segmentation, and forecasts for distributed/remote I/O products used with DCSs, PC-based control systems, and PLC systems in industrial applications. The results of extensive investigation into user needs regarding distributed/remote I/O hardware and related software products are presented. Detailed profiles of major vendors are provided.

Market segmentation and forecasts are provided by geographic region; Asia-Pacific, EMEA (Europe, Middle East & Africa), Latin America (Mexico, Central & South America), and North America; by industries and applications; by types of buses/networks; by mounting configurations; and by channels of distribution. Vendor shipments of distributed/remote I/O products, and market shares are provided overall, by classes of applications, and for each of the major geographic regions.

The report provides recommendations on how vendors (large and small) can enhance their market positions. These cover: products and product features, software, industries & applications to target, geographic markets to target, channels of distribution, promotion, pricing, buyer education and service, alliances, mergers & acquisitions, and other success factors.

## ABOUT VDC RESEARCH GROUP

VDC Research Group is a technology market research and strategy consulting firm that advises clients in a number of industrial, embedded, component, retail automation, RFID, AIDC, datacom/telecom, and defense markets. Using rigorous primary research and analysis techniques, the firm helps its clients identify, plan for, and capitalize on current and emerging market opportunities. We strive to deliver exceptional value to our clients by leveraging the considerable technical, operational, educational and professional experience of our research and consulting staff. During our nearly four decades of ongoing operation, we have had the pleasure of serving most of the world's leading technology companies, many high-profile start-ups, and numerous blue-chip early and later stage investors. Our products and services consist of research reports, annual research programs, and custom research and consulting services. Founded in 1971, the firm is located in the Boston area. Please visit our Web site at [www.vdcresearch.com](http://www.vdcresearch.com) to learn more.

For more information about VDC's *Global Market Demand and User Requirements for Industrial Distributed/Remote I/O, Fifth Edition*, contact:

Ladd Bodem, Director, Industrial Automation and Control Practice, 508.653.9000 ext. 127,  
[lbodem@vdcresearch.com](mailto:lbodem@vdcresearch.com)

Jim Taylor, Director, Industrial Automation and Control Practice, 508.653.9000 ext. 121,  
[jimt@vdcresearch.com](mailto:jimt@vdcresearch.com)

For pricing/purchasing information, contact:

Tim Shea, Account Executive, 508.653.9000 ext. 119, [tims@vdcresearch.com](mailto:tims@vdcresearch.com)

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## VDC RESEARCH GROUP

679 Worcester Road | Suite 2 | Natick, MA 01760

T: 508.653.9000 | F: 508.653.9836 | E: [info@vdcresearch.com](mailto:info@vdcresearch.com) | W: [www.vdcresearch.com](http://www.vdcresearch.com)

