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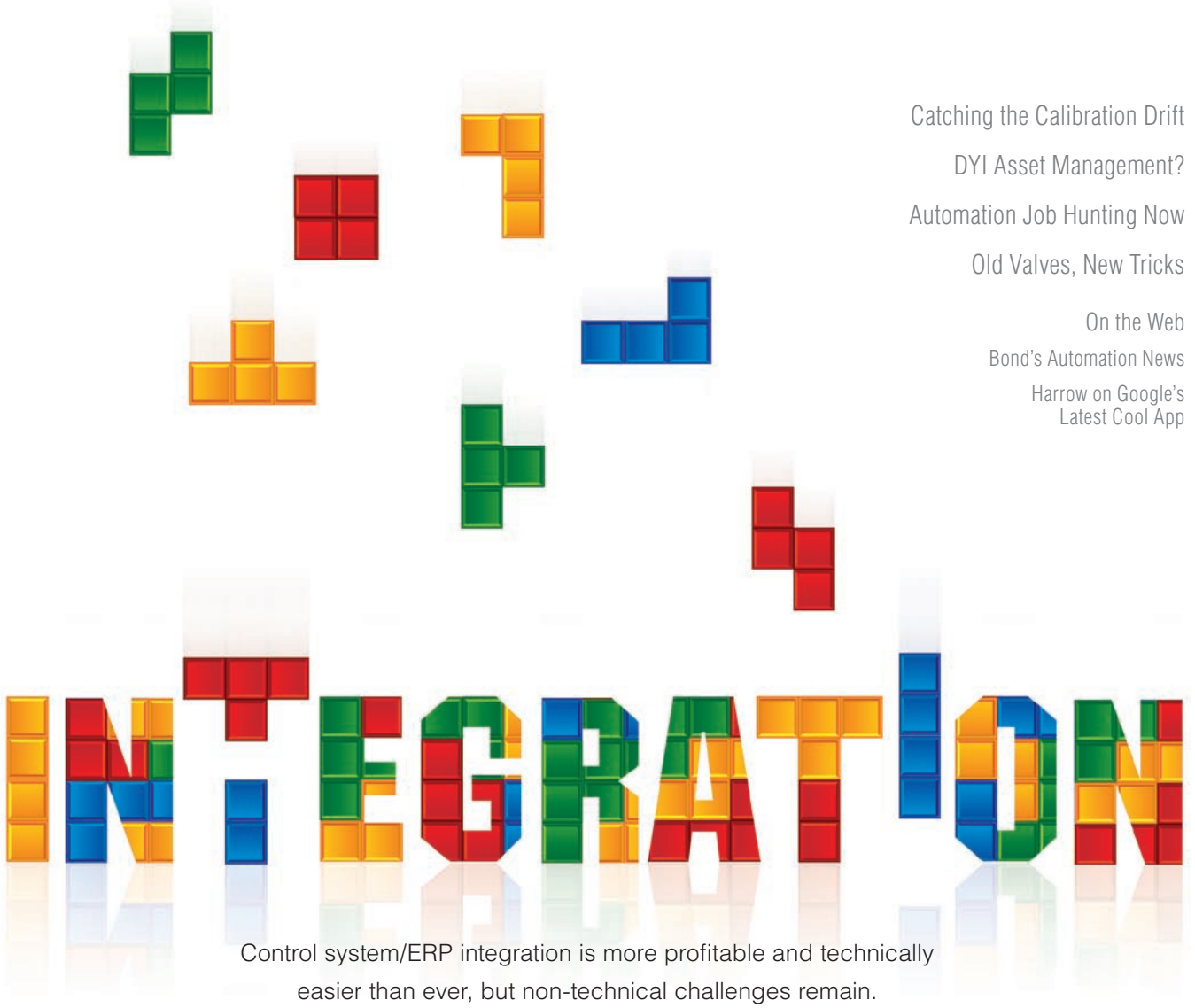

Control system/ERP integration is more profitable and technically easier than ever, but non-technical challenges remain.

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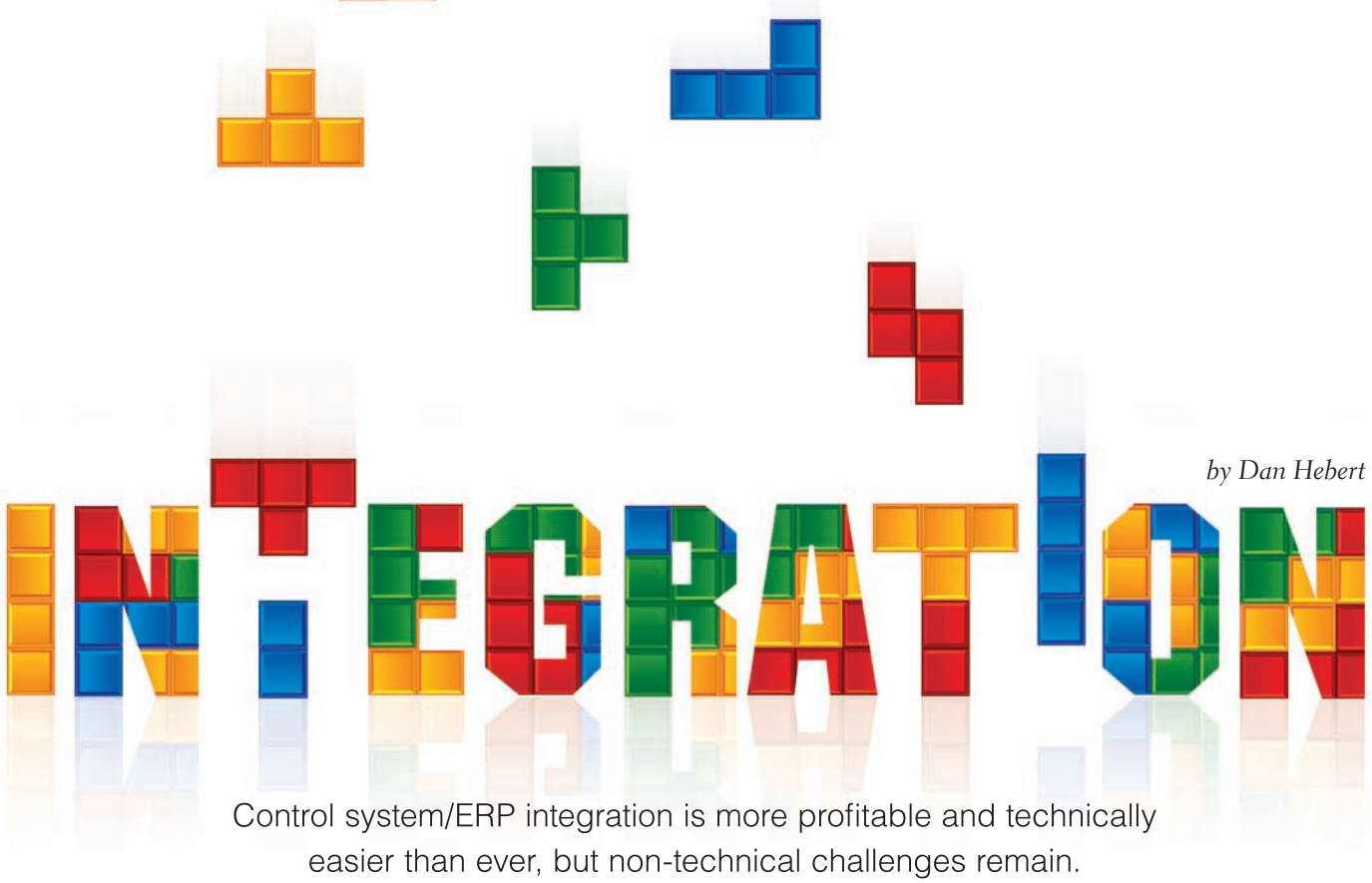


by Dan Hebert

Control system/ERP integration is more profitable and technically easier than ever, but non-technical challenges remain.

Implementing integration between plant control systems and higher level computing platforms such as ERP systems is more profitable now than ever thanks to the increased cost volatility of most plants' two main inputs—energy and raw materials—and more price volatility for plant products. At the same time, integration has never been technically easier because of the spread of standards that define terms for data exchange. Because these technical integration hurdles are coming down, implementation costs are dropping rapidly.

Increased profitability and lower costs should result in a flurry of control/ERP system integration projects, but this is not happening primarily because of non-technical barriers that remain stubbornly high—security concerns, reduced plant technical staff and, especially, turf wars between process automation professionals and their IT counterparts.

Price Volatility Increases

Process plants turn raw material and energy inputs into finished product outputs, hopefully at a profit. For a single plant, profits are maximized by producing highest-margin products. To do this, one needs to know the cost of raw materials, the cost of energy and the selling price of plant outputs. For firms that have multiple plants all capable of producing the same range of products, optimization for maximum profitability becomes more complex, but the problem is essentially the same—produce the highest margin products using the least possible amount of raw materials and energy.

Basic plant input/output equations haven't changed much in decades, but volatility of input costs and output prices has increased dramatically in the past year. For example, the price of oil peaked last summer at about $145 per barrel. Per barrel prices then dropped rapidly to about $35 per barrel by December of last year.

The story is much the same for energy prices. Electricity and natural gas prices move up and down rapidly, and tariffs from utilities to process plants increasingly reflect market reality. Many utilities used to change tariffs annually, but industry leaders now use locational marginal prices (LMP).

"With LMP, the utility fixes the price every five minutes, depending on grid congestion," says Paul Kurchina, director of industry consultant KurMeta Inc. (www.kurmeta.com). "LMP requires new billing objects in the ERP system, more intense monitoring in facility control systems, and closer communications between control and ERP systems."

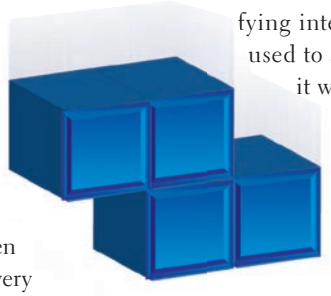
Many process plants are seeing increased volatility in prices paid by customers for their outputs. If your facility is a power plant, it's easy to see how LMP constantly changes prices for plant outputs. A refinery's prices don't change that rapidly, but they can change substantially over a few days.

Some process plants see much less volatility in prices for their finished products. Food, beverage, pharmaceutical and consumer packaged goods firms are good examples. But while these plants see slower changes in output prices, they still often experience rapid changes in costs for raw material and energy inputs.

How do these factors increase the profitability of control system/ERP integration? In the old days of stable prices, it was a lot easier to optimize plant production. One just had to enter monthly or even annual cost data for inputs, and make similar data entries for prices of outputs. Plant production schedules could then be optimized based on these data.

However, in today's era of volatile prices, monthly data entry is not good enough. Instead, data must be changed dynamically and in real time, and this means electronic links are needed between control and ERP systems.

The bad news is that your plant can't remain competitive without real-time data exchange between your control system and your ERP system. The good news is that this exchange is technically easier than ever to establish and maintain.



Standards Ease Integration

The bad old days of custom coding for communication between control systems and ERP systems are largely over. A number of industry-wide data exchange standards have arisen over the last few years, and just about every vendor of note is complying with one or more of them.

For end users, these standards save time and money. "We use OPC to communicate between our Oracle database ERP and our DeltaV control system," says Dan Cox, director of engineering for AOC Resins, Collierville, Tenn. (www.aoc-resins.com)

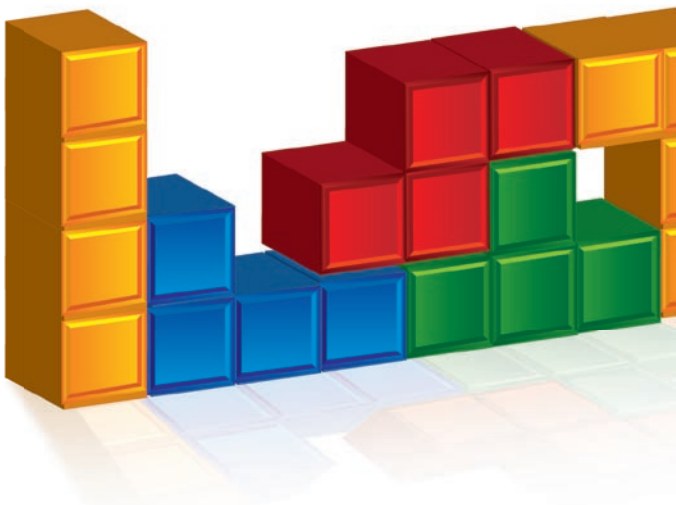
"We use an OPC tool developed by Matrikon (www.matrikon.com) called Generic Database Access (GDA). The GDA tool turns user-defined Oracle variables into OPC parameters. We wrote Oracle stored procedures that complete a function as needed. For example, via an OPC mirror, we insert the amount of a material used in a certain batch to an Oracle table that stores batch material usage for costing," explains Cox.

If OPC were not an established standard, the alternative for AOC Resins would have been to develop custom Microsoft .Net programming. "This custom work would have been difficult to scope, and the development would have been much more costly," Cox says. "OPC allowed us to focus on technologies in our wheelhouse, instead of on custom code that likely would have been outsourced. We have DeltaV programming experts, and we have people that can write Oracle stored procedures. We do not have people that write custom .Net code to integrate various systems."

Pavilion Technologies (www.pavtech.com) and Rockwell Automation (www.rockwellautomation.com) describe another integration project that took advantage of OPC and open standards. "We executed a control system/ERP integration project for a client that is truly a thought leader in the petrochemicals industry," says Angel Sustaeta, manager of strategic development at Pavilion. "Integrating data from the business system was enhanced by Rockwell's acquisition of Incuity (www.incuity.com), and by its use of open system standards such as OPC DA, OPC HDA and ISA95. These standards allowed us to implement the project in record time, even though it began before the Incuity acquisition."

The biggest challenge when integrating hardware and software at the control and MES level from different vendors used to be getting access to the existing data, notes Marc Leroux, marketing manager for collaborative production at ABB (www.abb.com). "But now," he says, "most control vendors support OPC, which makes it easier to get to the data. At the MES level, almost everyone supports an ODBC database connection, and many new systems also support CML or web services. There's still engineering work to do, particularly specifying interfaces and getting agreement on the method used to access the data, but it's much easier now than it was five years ago."

Leroux adds that standards such as ISA95 have done a good job of promoting integration between control systems and the enterprise. "The standard probably hasn't decreased complexity, but it has eliminated a lot of risk for end users," he says. "Now an end user knows that he can replace systems on either side of the interface with confidence that the interface work is not going to have to be redone."



Non-Technical Challenges Remain

While standards have eased the technical side of integration, non-technical hurdles remain high—chiefly because. integration between control and ERP systems requires automation pros to leave the comfort zone of their plants.

Justifying and implementing a change that affects only your in-plant automation system is relatively easy. You present your case to the plant manager, he or she accepts it, and you execute the project. You never have to leave the plant to justify and implement the project, and you only interface with familiar faces.

By contrast, control system/ERP links require contact with other departments, particularly IT. "Interestingly, the most significant challenges are often not with equipment or systems, but with the personalities involved," says Amy Davidson, product marketing manager for asset optimization at Emerson Process Management (www.emersonprocess.com).

"Computerized maintenance management systems (CMMS) and other software suites are often owned by entities other than the maintenance departments that use them. In a project we implemented, CMMS was controlled by the IT department, and IT personnel can be protective about others interfacing with their systems. Once you get over the IT hurdle, the rest is easy," Davidson adds.

Others also voice IT concerns. Cox, of AOC Resins, says, "Engineering was responsible for getting data pushed to the Oracle ERP system. Where the data needed to go was defined, but getting it there took an iterative process. A trial-and-error period was needed, but IT wouldn't dedicate a resource to writing the stored procedures. Engineering could write the procedures, but was not allowed to, so progress was slowed due to territorial issues. Eventually the need for data overrode territorial complaints, and both parties focused on completing the development."

Another non-technical challenge is just finding time to do the detail work necessary to support integration, especially with the reduced staff on hand at many process plants. "Standards make database-to-database queries more convenient, but they still require manual initial associations to make the proper connections," explains Jeff Waufle, IT technical services supervisor with Nevada's Las Vegas Valley Water District (www.lvvwd.com).

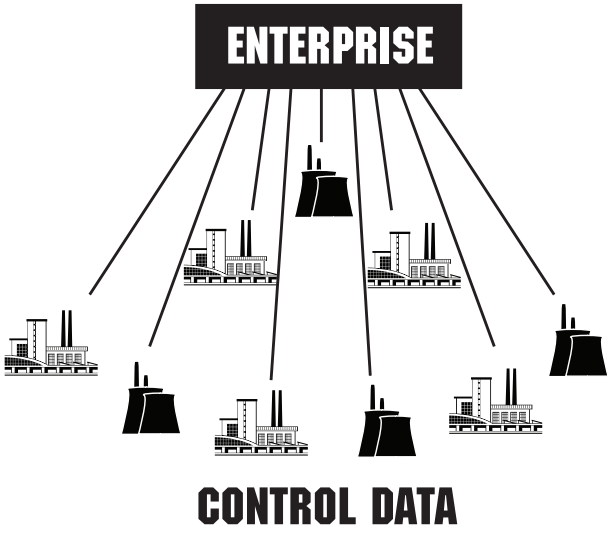


image courtesy of KurMeta Inc.

Integration from ERP systems to plant control systems is simplified in this diagram. No matter the control method, all users are interested in a single version of the truth.

MAKE BUSINESS CASE FIRST

Control system/ERP integration requires close cooperation among multiple departments. For process automation pros more used to working within their silos, this can be a real challenge. System integrator Maverick Technologies (www.mavtechglobal.com) has implemented scores of control system/ERP integration projects for a number of process industry clients. Maverick vice-president of business solutions, Chris Jones, describes how his company gets buy-in from all departments by making the business case first. "Our biggest integration challenge is not technical, it's identifying the business objective of linking the control system to the ERP systems," says Jones.

If the business objective is not identified beforehand and agreed to by all affected parties, then the cooperation needed to implement the project will be nonexistent.

"It's often difficult for organizations to understand what kind of information they want to bring in. What is the important information? How will it be used? It's not just how to get data in and out. Companies are always saying they want data, but if they don't do anything with the data, the project will fail," adds Jones.

"The real challenge is finding the business objective. For example, does our customer want better information about actual materials consumption and about ingredients and lots in a batch so they can improve quality? This could allow a process manufacturer to leverage relationships with customers as the highest-quality producer. So one has to find the business drivers for integration, specifically identifying specific value that will be delivered," explains Jones.

"That is where we come in. Maverick has the depth and breadth in these industries and has worked with a variety of technologies and applications. We can take a consultative approach and find out the business drivers and objectives, such as quality, throughput, downtime, capacity or a combination thereof. And based on the current conditions existing in the facility, we can put in processes and access to information—integration that will drive real change," concludes Jones.

NON-TECHNICAL INTEGRATION CHALLENGES

1. Building a business case to justify return on investment
2. Cooperating with other departments, particularly IT
3. Finding time to do the detail work
4. Complying with heightened security concerns and regulations

INTEGRATION BEST PRACTICES

1. Make the business case first
2. Get buy-in from all departments
3. Only buy products that comply with standards
4. Use standards to communicate among applications
5. Limit or eliminate custom code
6. Use middleware as the transfer point
7. Learn more about middleware, ERP and IT

"Linking databases requires knowledge of both systems. Staff members with this knowledge are usually people key to ongoing operations who have limited time to sort through the massive amounts of data that require accurate associations. It's not a complex problem, just one that requires tedious accuracy. Tasks can be distributed, but the more people involved, the more chances you have of inconsistent results," adds Waufle.

Best Practices

In the past, best practices included lots of technical items, as this was where complexity was greatest. Now best practices are more focused on up-front justification and planning, because without justification there is no project. "For anything we do there has to be a return on the investment or some other reason to do it, such as legal requirements," says Gary Crenshaw, electrical engineer with Beam Global Spirits and Wine, Cleremont, Ky. (www.beamglobal.com) "If there is no return on investment, there will be no integration from SAP to the plant floor."

The best way to justify return on investment for integration projects is to make the business case first. Once a business case has been made, there is a compelling reason for upper management to get behind the project. Upper management backing then convinces all departments to give integration projects the support they need.

Another best practice is to use standards for communication whenever possible. The custom coding alternative is not only more expensive initially, but also harder to maintain.

One technique employed by many for control/ERP system integration is to use a manufacturing execution system (MES)-level product as a transfer point for communication. "Our engineers and programmers have found that using SQL Server as the transfer point provides more flexibility to work with legacy systems," says Jerry Leuthold, senior software engineer at system integrator Bachelor Controls (www.bachelorcontrols.com).

A technical best practice that may work for some is to just bypass IT. Alan Cannon is a process/automation SCADA engineer for Plastic Omnium, Duncan, S.C. (www.plasticomnium.com). Like most automation pros, he had no direct experience with SAP.

"ERP integration in its simplest form is probably pretty easy for someone who lives in that environment," observes Cannon. "But it was challenging for me because I had no knowledge to pull from, as I usually work with real world I/O and PLC logic. So I read the 75-page manual on integration with SAP, and I was able to create every tool necessary to make connections between our InduSoft (www.indusoft.com) HMI and SAP via Microsoft SQL in less than an hour. But without the STD.net framework, the interfaces and the output windows contained within InduSoft, my debugging time would have been increased tenfold."

So even if it's impossible to bypass your company's IT department, it certainly helps to know as much as possible about the IT platforms that interface to manufacturing.

Standards make the interfaces among control systems, MES platforms and ERP systems easier to understand for process automation pros. This can expedite learning and result in a deeper knowledge of the entire integration process, which makes meetings and negotiations with the IT department much easier, and results in better solutions. ■

Dan Hebert, PE, is Control's senior technical editor

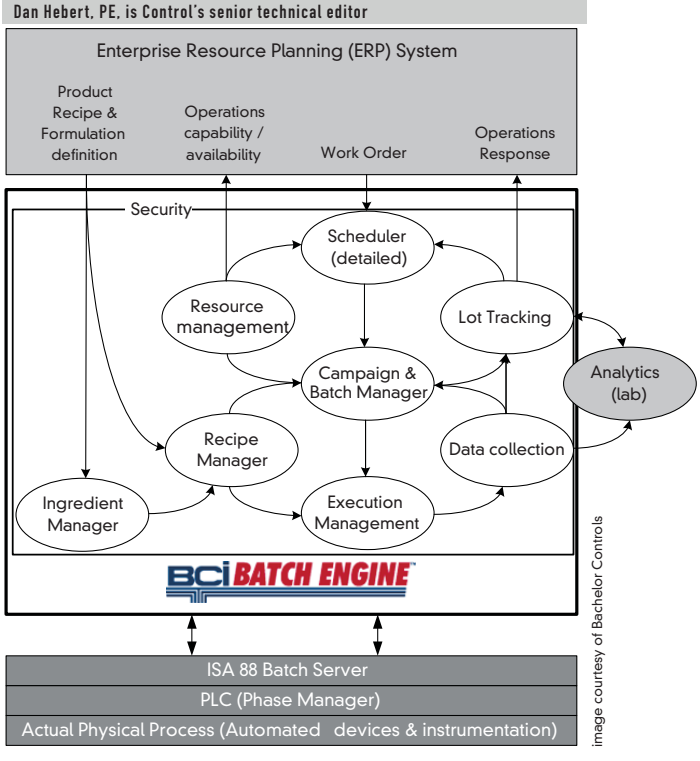


image courtesy of Bachelor Controls

Middleware like the batch engine software shown in this diagram is often used as a transfer point for communications between plant control systems and ERP systems