



Flexible connectivity unlocks operational resiliency

Meet the standardized data
needs of today's mix of emergent
technologies and an installed
base of legacy systems



We know, now, that we're resilient. We know that focus on the work persists despite isolation and concern. We know that manufacturers scarcely skipped a beat transitioning to virtual environments for back-office and other key functions, while ensuring the safety, security and well-being of all personnel.

But what about our systems and ways of doing things? Have they proved to be as resilient as we are?

"Perhaps the most worrying takeaway from the recent pandemic concerns our lack of preparedness as nations, industries, and companies to deal with similar systemic crises, which are inevitable in our increasingly digital and interconnected world," said Sandra Ng, group vice president for Research at IDC.

IDC believes that digital resiliency – the ability for an organization to rapidly adapt to business disruptions by leveraging digital capabilities to not only restore business operations but also capitalize on the changed conditions – must be a key objective in every organization's digital transformation efforts.

Today's manufacturing industries are highly computerized. Their operations are highly automated. While data silos stubbornly persist, enterprise business systems and industrial control systems achieve an astounding degree of integration, each in its own realm.

Yet, amidst the pandemic, how quickly were manufacturers able to respond to sudden changes in demand, surging online sales and

rising customer expectations? How well will they respond to future needs to remake supply networks? In light of skilled workforce challenges, are they prepared to optimize process automation?

Thomas Gaudet, head of PTC Kepware product management, believes that to make our manufacturing systems even more resilient we need contextualized connectivity amongst production operations, business enterprise systems and the greater supply chain.

In other words, a higher degree of resiliency requires leveraging of real-time operations data to better inform the business enterprise, and vice versa. To do so, information technologies (IT) and operations technologies (OT) must converge.

But while Internet protocol technologies, such as Ethernet, provide the basis for both IT and OT communications, OT relies heavily on proprietary and purpose-built communication protocols.

The end result of this IT/OT schism is that manufacturers are hobbled by systems that lack the resiliency needed to support real-time decision-making.

On the other hand, "We know organizations today that are seeing benefits from Industry 4.0. They are seeing the results of that commitment," said Gaudet. "Others are just beginning to go that route and don't yet have a connectivity strategy."

Industry 4.0 is one of several terms, including the industrial

internet of things (IIoT) and digital transformation, that are used to denote various aspects of continuing industrial computerization, including the incorporation of edge and cloud computing.

The challenges of achieving genuinely resilient operations encompass people, processes and best practices. Many Industry 4.0 initiatives fail or fail to scale, noted Gaudet. Often the reasons include the enterprise's traditional data-siloed architectures.

STRAIGHTFORWARD ASSERTIONS

Recognizing that architecture solutions are not yet readily available to achieve the needed transformation, Gaudet pointed instead to some leading

manufacturers achieving resiliency by standardizing connectivity in their plants and factories.

Rockwell Automation uses its FactoryTalk InnovationSuite, powered by PTC, as part of its ongoing digitalization efforts. Connectivity-driven applications include intelligent asset optimization, predictive maintenance and model-based analytics.

At **Greiner Packaging**, digital transformation is about increasing technology standardization. Greiner achieved flexibility using ThingWorx Kepware Server. Kepware connects around 500 machines in 11 plants, transmitting data via an SQL protocol to its OPC router and MES at company headquarters.

Another packaging supplier, Switzerland-based **SIG**, makes aseptic carton packaging and equipment for beverages and liquid food. The speed, security and scalability of ThingWorx Kepware Server drove flexible connectivity. Connecting a fleet of customized machines to its MES normalized disparate data sources and increased transparency across operations.

A maker of braking systems and components for vehicles and machinery, Italy-based **Brembo** has production sites in 12 countries across Europe, Asia and the Americas. Its ThingWorx solution uses Kepware to integrate data across production lines, bringing near real-time data from PLCs to quality maintenance and enterprise systems. Three custom mashups

give users real-time, actionable data, including data that can be leveraged for overall equipment effectiveness (OEE).

TOOLS FOR PRODUCTIVITY

"To me, it's about having a common tool for connectivity," said Gaudet. "Too many companies have a very ad hoc approach to connectivity. They may allow a system integrator or other third party, or some single group within the company, to make decisions that impact everyone. On the other hand, simply employing common naming conventions associated with the applications so that there is a common structure across the different groups in the organization is a tremendous benefit."

Another factor constrains some companies that need to better manage

data, Gaudet said. It may be hard to believe in this day and age, but even now there are engineering departments in manufacturing companies where someone will say, "How hard can it be to build a device driver?"

A device driver, for those not familiar with the term, provides a software interface to a hardware device, enabling operating systems and applications to access hardware functions. A driver communicates with the device through the computer bus or

PTC Kepware is best known for its extensive library of device drivers, which provide software interfaces to hardware devices.

communication subsystem to which the hardware connects.

Given the huge increase in devices connected to the Internet, the importance of device drivers in achieving connectivity has also grown.



Conceptually, it may not seem like a hard thing to do, said Gaudet, "But time and again we hear that the result was failure, that the driver didn't scale or wasn't secure."

DRIVEN TO SUCCEED

A research spotlight from LNS Research, "**Plant data and connectivity,**" authored by Patrick Fetterman, supports Gaudet's view. About 45% of surveyed manufacturers say they are unable to reference a definite list of connections in the plant or define what data flows through those connections, reflecting this history of ad hoc plant connectivity solutions.

Most of today's companies employ systems based on the ISA-95 enterprise architecture, the research points out. This structured architecture draws a

distinct line between enterprise and operational data. Companies use the former for corporate planning and the latter for daily production scheduling, for example.

Cloud, edge and IIoT gateways disrupt this structured architecture approach and enable data transfer and sharing. Standardizing connectivity allows edge and cloud to deliver a powerful one-two punch.

Thus, in contrast to ad hoc connectivity efforts, standardized industrial connectivity ensures an integrated view of plant operations, precludes tedious software deployments and ensures scalability.

With this kind of connectivity amongst OT assets and systems, as well as enterprise systems and

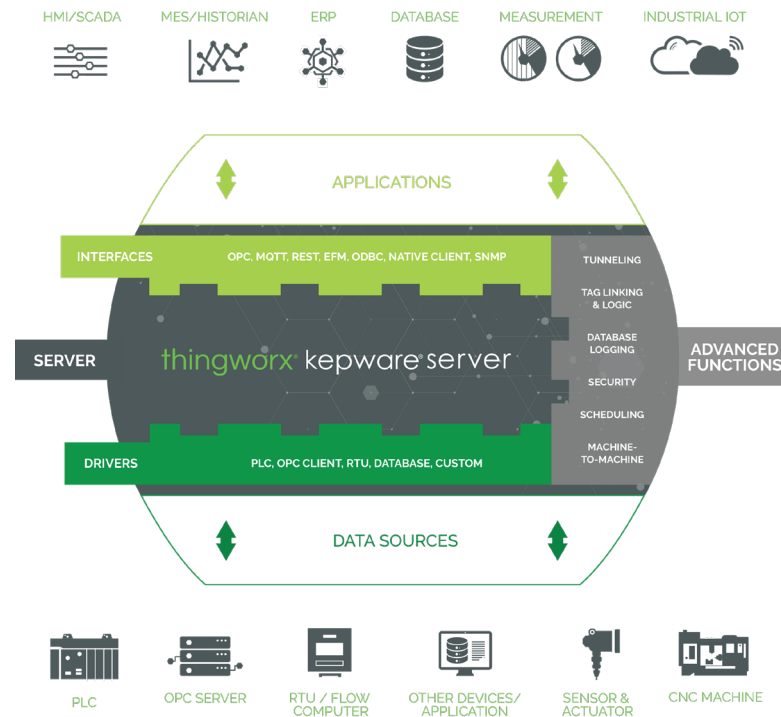
data sources outside the plant, the research firm sees plants equipped to preemptively identify operational bottlenecks across plants and gain insights that address those looming constraints.

Fetterman's research foresees "growing investment in connectivity as a critical first step for digital transformation" combined with IT/OT convergence efforts as analytics are more widely applied.

PTC ThingWorx Kepware Server allows users to manage diverse automation devices and software apps through a single interface.

PTC Kepware is best known for its comprehensive library of device drivers.

However, Gaudet said, besides drivers, other tools are relevant based on the type of connectivity involved. One example would be a



bespoke proprietary format. In fact, Kepware's latest universal device driver includes scripting capability to allow connection to a wide range of ancillary devices.

This approach to connectivity culminates in ThingWorx Kepware Server, which provides a single source for industrial automation data to all of an enterprise's applications. Users connect, manage, monitor, and control diverse automation devices and software applications through one intuitive user interface.

ThingWorx Kepware Server leverages OPC — the automation industry's standard for interoperability — and IT-centric communication protocols, such as SNMP, ODBC, and web services, to act as a single source for industrial data.

THE ENGINEER'S PERSPECTIVE

Executives may simply need to know that ThingWorx Kepware Server acts as a communications system for ensuring connectivity and communication across a network of computers. What's important for engineers, said Gaudet, is the product's resilience and long-term reliability.

"For systems integrators or control engineers who travel from plant to plant making changes that may be physical or virtual, having a common tool set delivers quantifiable benefits," said Gaudet. "We're continuously evolving our solution to make sure it's up-to-date and that moving data from the plant floor to the business enterprise is not a vector of attack, cybersecurity-wise."

The end result of having a toolset for connectivity is that an engineer can deploy any Industry 4.0 application in a standard format.

- IIoT applications are repeatable and scalable within and across multiple facilities
- Engineers are eager to replicate the success of previous Industry 4.0 efforts by their peers
- The specifics of connectivity to each machine are abstracted away from the engineers building applications
- Engineers don't have to be trained on multiple connectivity systems

"Our OPC server is well known for reliability and resilience. Not only is data pulled into ThingWorx Kepware

Server and converted into a standard like OPC, but other applications also pull data out of our tool set. We can publish directly to the cloud using MQTT and REST. We convert data into ODBC to log data into databases, without additional strain on the connected devices. We manage the connections to keep the devices focused on operations functions, as opposed to being hindered by additional connectivity. It's not your grandfather's OPC," Gaudet said.

In production environments, connectivity at the PLC level can involve challenges identifying units and the communication protocols involved.

"Our naming conventions are aligned with those of the original manufacturers. Our Allen-Bradley ControlLogix driver is named that

because it connects to Allen-Bradley ControlLogix devices. Second, the default settings on our solution allow a quick set up," said Gaudet.

The resulting data collection infrastructure is standardized, secure and maintainable.

- The data collection infrastructure is not overly complicated
- Standard IT and security tools can be applied to the data collection infrastructure
- The data collection infrastructure adheres to information security best practices

SECURITY OF PROCESS

Security can be an overriding concern for some manufacturing enterprises

and is an issue that must be addressed, said Gaudet.

Operations technology presents unique cybersecurity challenges. While IT for the business enterprise concerns itself with data integrity, availability and confidentiality, things are somewhat different for operations environments. Reliability, availability, maintainability and safety of mission-critical industrial control systems are paramount, including SCADA systems.

OEM equipment builders, systems integrators, technology providers and goods makers themselves all have a stake in harnessing machine data to increase reliability and optimize processes. Ad hoc processes jeopardize security and risk mistakes.

"It's increasingly important for the individual applications to be as secure as possible. The legacy protocols we are called to connect to are not secure in that way. Fewer than a handful of the latest devices have security that leverages modern encryption technologies on plant floors," Gaudet said.

When that device data transfers to the next level, the application responsible for its conversion to secure data must be doing that using the most modern technologies. "ThingWorx Kepware Server does that," said Gaudet. "We employ penetration testing and make sure industry standards are maintained with regard to software development. We do all those things. We regularly have third parties try to attack us. And we have testing that validates security in situ."

Organizations do standardizations to achieve efficiency and resiliency. They see savings in providing engineers with a common platform. "But there are also savings to be had by replacing either in-house created connections that are no longer secure or not performing as expected. There are savings in replacing that ad hoc way of doing things," said Gaudet.

RESILIENCY REALIZED

Digital resiliency is defined by research analyst firm IDC as "an organization's ability to adapt to business disruption using its digital capabilities." These disruptions may follow from ecological, health, economic or even social causes.

IDC believes that in today's interconnected global economy,

the pandemic has demonstrated that resiliency is now a business imperative. Digital technology is the lynchpin to modern enterprise resiliency to the point where a new kind of resiliency is called for: digital resiliency.

In the wake of the COVID-19 pandemic — and amidst other indicators of the turbulent times we live in — resiliency has become a much-discussed issue. But we

shouldn't let all the talk hide the fact that it is an issue with real proven solutions.

As Gaudet has attested herein, ThingWorx Kepware Server is dedicated to the proposition that a first essential step in achieving digital resilience involves a comprehensive approach to managing connectivity in operations and the business enterprise, for both reliability and optimization.

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