Dynamic Duo of Industrial Connectivity
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Ever have a system integration project that required superhuman effort to complete? It's almost criminal to think of the problems users face when attempting to create an integrated system of multiple-vendor products and applications. Unfortunately, no single protocol is going to swoop in and save the day. It requires integrating multiple complementary protocols, each with individual strengths, to achieve the goal of a true enterprise system. Leading the way is the dynamic duo of OPC and Modbus.

Figure 1. Enterprise hierarchy

TRUTH, RELIABILITY AND THE INTEROPERABLE WAY

Although the physical setup of manufacturing or process automation systems varies greatly, the majority can be represented by a three-tier architecture consisting of the Control, Operations and Business layers. The Control layer represents low-level data transfer and control. The Operations layer includes software products such as visualization and supervisory applications, data storage, calculation and other automation packages. The Business layer represents the higher-level visualization and reporting packages, decision support software, advanced analysis and web-based applications.

Just as each superhero has their strengths and weakness, there are also distinct connectivity requirements between tasks performed by applications in the multiple levels of the enterprise hierarchy. The protocols used at each layer, and used to create interoperability between the layers, need to be targeted for different applications.

HEARTBEAT OF INTEROPERABILITY

The heartbeat of any industrial process is the communications network between the transmitters, controllers and other control and measurement devices. The key requirements in keeping the data flowing are robustness, determinacy and compatibility. For many years, proprietary networks and individual vendors held tight-fisted control over this layer. Users feared the consequences of expanding or making changes to their systems, and desperately needed someone to free them. Modbus is often classified as a fieldbus protocol, but with its various enhancements it is suited to an even wider range of communication applications.

One of the reasons for its success is that Modbus is a simple and sturdy protocol. It may not be as flashy or sophisticated as some other interfaces but gets the job done. As a straightforward protocol, it is easier and faster to code, apply, and troubleshoot than
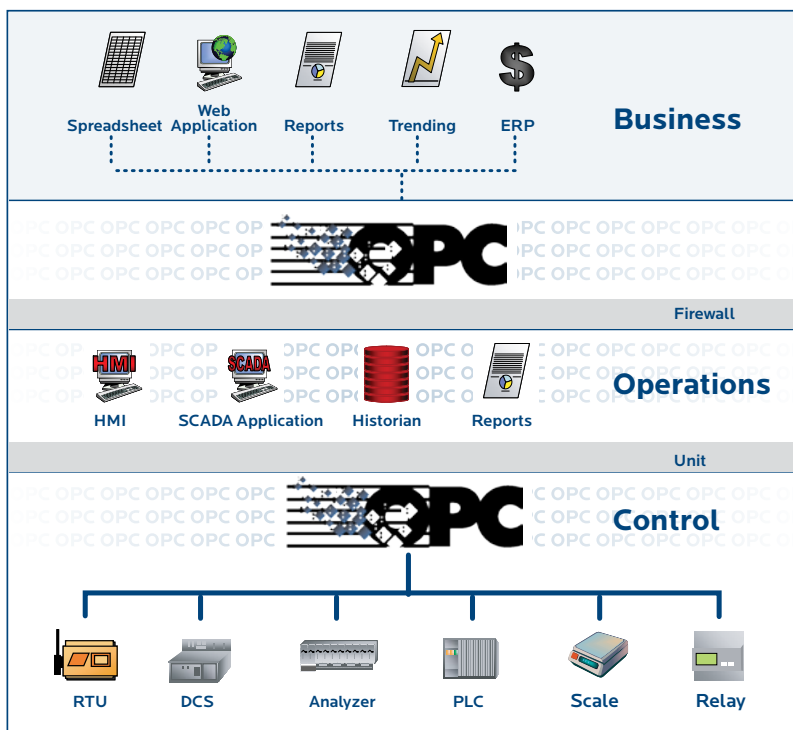
more complex interfaces. For this reason the serial versions of the Modbus protocol have long enjoyed a position of market leadership. Its reliable, consistent nature has also led to a rapid acceptance of Modbus TCP as an Ethernet-based communication protocol.

This strength in adaptability means Modbus may not have all the fancy gadgets on the utility belt needed to deal with higher-level applications. Extended data type support, mapping logical object structure, and true peer-to-peer architectures are some examples of higher-level functionality enterprise systems require. When Modbus is paired up with a higher level application protocol such as OPC the result is a powerful integration team.

THE DYNAMIC DUO
If the Control layer is considered the working elements, then the Operations layer provides the direction. The Operations layer contains the applications that transform data into useful information and knowledge, and bridges the lower and higher hierarchies. Organizations need large amounts of data, quickly, derived from multiple sources and delivered to many destinations simultaneously. Proprietary systems and single-vendor dominance is also a dark reality at this layer. To achieve the benefits of flexible, scalable and interoperable systems, without extortionate integration costs, the protocol for this level should be standardized across multiple vendors, systems and products. These characteristics make OPC well suited for the task of connecting this layer with the other levels. OPC offers separate specifications to address different data semantics, including real-time data, historical data, alarm and event information and batch data. The interfaces are comprehensive enough to provide the functionality users require, yet simple and practical to implement, which results in wide vendor acceptance. This includes the availability of OPC products for complementary protocols, most significantly Modbus.

IT'S OPEN, IT'S INTEROPERABLE, IT'S AN OPC SERVER FOR MODBUS.
The MatrikonOPC Server for Modbus provides connectivity to Modbus-compliant devices such as any PLCs, RTUs, DCSs, and other Modbus devices at the Control layer. These robust servers can connect to multiple devices using one or more Modbus protocols at the same time, and each read/write operation is optimized to maximize throughput. This server has been rigorously tested with hardware from vendors including ABB, Emerson, Honeywell, Koyo, Schneider (Modicon), Triconex, Yokogawa, and many others.

The MatrikonOPC Server for Modbus is an OPC-compliant server that enables data interchange between Modbus-compliant devices and higher-level OPC clients including historians, trending packages, HMIs, reporting applications and spreadsheets. OPCs plug-and-play connectivity enables users to focus on value-added business activities rather than

struggle with complicated system integration problems. The MatrikonOPC Server for Modbus enables users to create truly scalable systems where they reap the benefit of being able to choose which components are appropriate for their system, without vendor dependence.

TAKING CARE OF BUSINESS
The trend at the Business layer, as well as in parts of the Operations layer, is towards open interfaces and web- or service-based technologies. Applications at the higher level are concerned with consolidating information from various sources, compiling it into reports, and summarizing those into key performance indicators and other decision-support metrics. It is therefore important that there be easy access to the all the underlying sources to allow for aggregating and analyzing data across multiple functions and applications. Early speculation is that OPC UA will be the protocol of choice for integrating the Business layer with Control-level protocols such as Modbus. OPC UA provides a rich information model and standardized messaging, which will provide interoperability between the various event-processing and automated analysis applications. Also, any cross-enterprise management system must be scalable and secure. All aspects of the OPC UA specifications have been designed with both robust security and a wide range of scalability in mind.

OPC UA - THE ULTIMATE SUPERHERO
Because all protocols when boiled down to the basics represents moving data between applications, there are those that want to elevate one protocol to replace all others. Already there are many discussions and forums touting one protocol versus another. Inevitably, there will be those that will try to make OPC UA out to be the invulnerable 'Protocol of Steel', a protocol able to swoop from the sky and solve all the world's integration problems. The reality is OPC UA is not designed to replace every protocol at all levels of the enterprise. What OPC UA does aim to do is provide interoperability to all levels, which means it will complement application-level protocols and other industry-specific standards, including 'classic' OPC and Modbus. Just as everyday heroes help others to help themselves, OPC UA is designed to unify and enhance the power of existing applications and protocols.

THE REAL WORLD
As industry standards evolve and strengthen, those with wide adoption and proven interoperability will continue down the road of enterprise integration while others will fade into obscurity. System architectures will always involve a selection of protocols and standards. The key is choosing well-established, complementary protocols like OPC and Modbus that offer the best interoperability options.