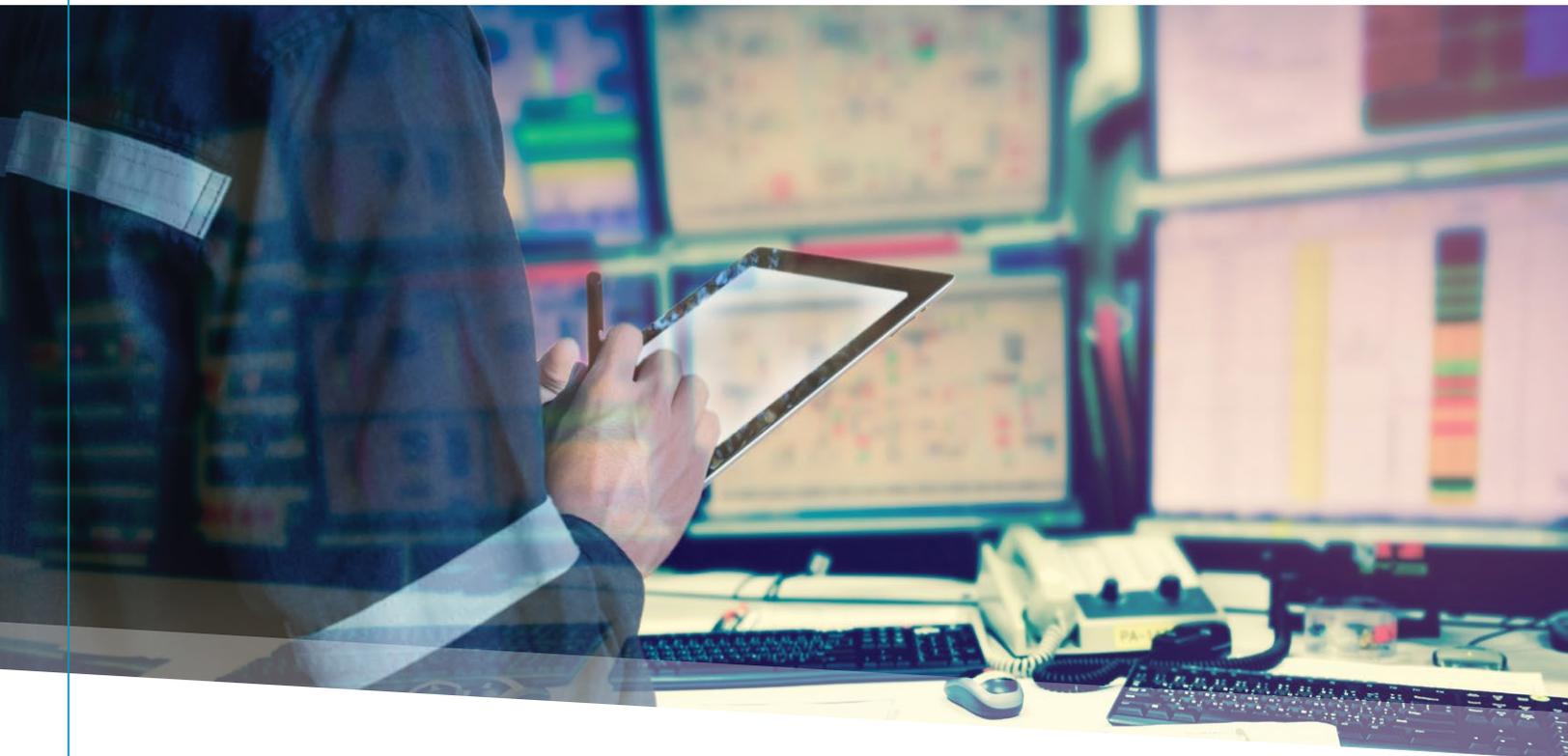

Leveraging Real-Time Visualization and Documentation Across Ethernet Endpoints





Introduction

As production facilities aim to further automate their processes by using the latest smart manufacturing technology on their plant floors, the number of connected devices that need to be documented and monitored dramatically increases. Automation and controls engineers are finding the need to work collaboratively with Enterprise IT engineers to integrate older proprietary and serial industrial networks with new networked systems that automatically communicate through IT infrastructure.

With their previous systems, there were only a few nodes to control and monitor. Managing and troubleshooting automation networks required only programming software tied to the automation system. Today, Industrial Ethernet, which uses standard Ethernet packet transmission along with automation-specific application layers and a ruggedized physical layer, is the new standard for industrial automation and process control.

These systems connect computers, networks, data centers, machines, and a variety of other devices. While these systems use IT-based technologies, their impact on plant output requires collaboration between IT personnel and automation and control engineers to ensure the Ethernet network provides an effective control system foundation for plant operations.

With so many connected devices to manage in industrial environments, it can be challenging to identify and visualize where each device and system are connected. Reactive detection, diagnosis, and problem resolution have become increasingly costly and more time-consuming. In the United States, 61% of manufacturing maintenance strategies are “run-to-failure”.¹ This white paper discusses how leveraging real-time visualization and documentation across Ethernet endpoints proactively resolves connectivity issues to increase uptime and cost savings.

Real-Time Visualization of the Plant-Floor Network

As the number of smart, connected devices implemented on the factory floor increases, so does the likelihood of a failure. This is especially true for companies that have more established manufacturing processes. Many of these plants are being retrofitted with new equipment piecemeal as permitted by time and budget availability. Not all components are added to the factory floor at the same time or by the same technicians. Often, efforts are made to manually track information such as the IP addresses for devices on the plant floor and update industrial network drawings. Most data collected today is not used for predictive analytics that can optimize operating efficiency.²

The manufacturing floor can be a harsh environment making automation networks highly susceptible to interruptions. These interruptions result in downtime and lost production, especially since closed-loop process control often relies on an Ethernet link. Frequent breakdowns can be costly for manufacturers or potentially dangerous for factory floor workers. Unexpected stoppages can cost billions of dollars in lost revenue. Some examples from ARC Advisory Group³ case studies show the extreme value of saving an hour of downtime in many industries:

- Automotive OEM Stamping Machine: \$43,000/hour of lost revenue; That is \$720/minute
- Food Packaging Line: \$15,000/hour of lost revenue for a typical packaged food or consumer item; That is \$25/minute
- Pharmaceutical Batch: \$500,000/batch when interruption of a batch causes the entire batch to be scrapped; This is approximately \$8,300/minute
- Paper Drying Line: \$31,000/hour of lost revenue for a typical bottleneck in paper production; That is \$516/minute

Ideally, automation and controls engineers need to assure network uptime with real-time visualization and monitoring of the entire network, in addition to network diagnostic capabilities. With awareness into all levels of devices and connectivity, operational field technicians can effectively communicate about issues with IT and automation teams who are not network or machinery experts. Panduit's IntraVUE™ industrial network visualization and analytics software offers automation and controls engineers the ability to address the challenges unique to these industrial environments.

“... a higher initial cost, predictive maintenance strategies have shown to substantially reduce probability of failure, along with decreasing downtime and being cost effective overall.”¹



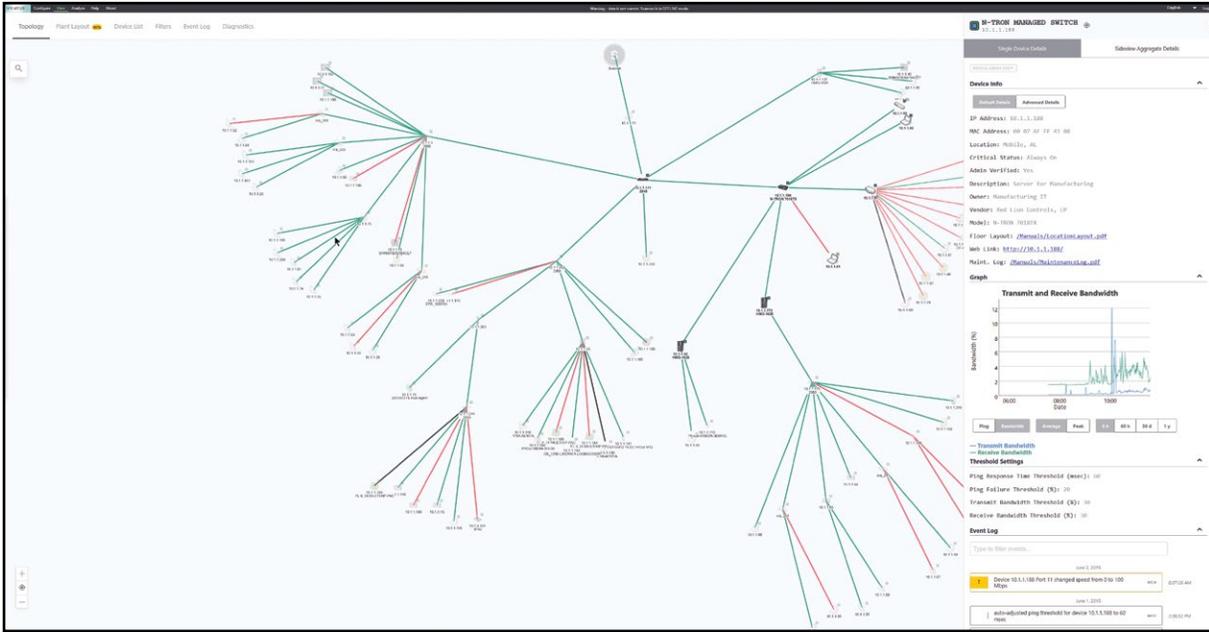


Figure 1. A schematic of how everything in the plant floor might be connected over Industrial Ethernet.

Continuously Monitoring the “Edge” of the Network

With the implementation of the Internet of Things (IoT) through Industrial Ethernet, the number of connections at the very edge of the network has grown drastically and the architecture of networks has become increasingly complex. Many components on the plant floor are now interconnected, including Input/Output (I/O) devices, programmable logic controllers (PLCs), human-machine interfaces (HMIs), drives, process instruments, and IP cameras (Figure 1).

Instead of only providing computing resources, these connected devices make machines move, sense positions, and provide safety features. These devices also have requirements and applications that are quite different than the typical Ethernet network operating in an enterprise environment. Within plant networks, it is critical for IT teams and automation and controls teams to work closely together to ensure the uptime of not only the network, but all the devices on the network.

Traditionally, typical networking tools are often extended from enterprise environments to perform the important roles of configuring and monitoring the switch networks. These tools may be familiar to non-IT personnel, such as the technicians on the plant floor. This can be a major challenge when issues arise on the plant floor because first responders are technicians who understand the devices. It is important to have a tool that simply and clearly provides the appropriate details about an issue, so the device can be effectively reset, repaired, or replaced.

Easy-to-view, real-time interactive software graphics available today (Figure 2) provide IT and automation and controls engineers with a single web-based application, to visualize all the network’s devices all the way to the edge of the network from a single location.

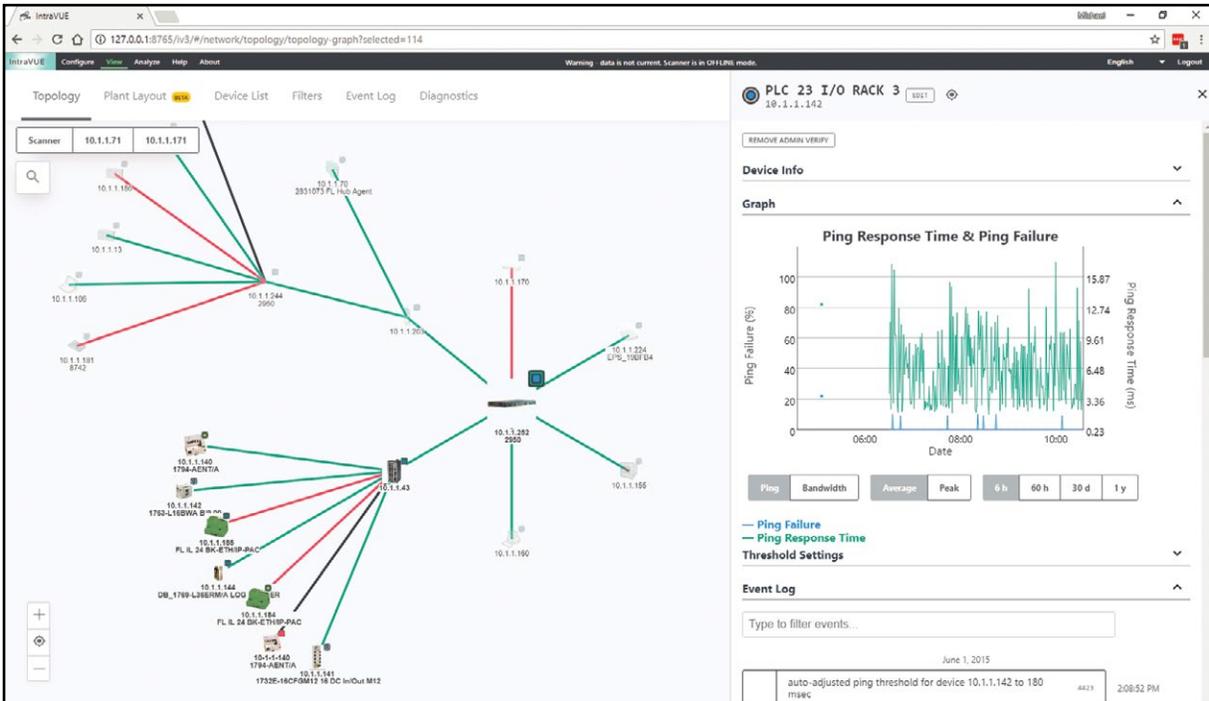


Figure 2. IntraVUE software graphically displays where the broken connections occur. The red line indicates a disconnected device. Additional details about the port on the switch where the device should be connected are available by hovering over the line.

Access to Actionable Information

Issues with deployed plant equipment are significantly more expensive to resolve than machinery issues discovered during design or development. As the plant floor initiates more connectivity points, the increased risk of downtime issues occurs. Automation and controls engineers need to provide information to electricians and technicians so they can easily support interconnectivity.

To simplify this process, automation and controls engineers can use a tool such as IntraVUE™ software to always have on-hand critical information to support their plant throughout the operation. Deeper levels of visibility can be provided based on the stakeholder group receiving the reports. These reports can identify issues and offer suggested courses of action for many common problems that can occur on Industrial Ethernet networks, including:

- Device failures
- Duplicate IP addresses
- Broadcast or multicast storm
- Intermittent connection problems
- Devices that were accidentally moved
- Foreign computers momentarily linking to the network (security issues)
- Large file transfers between devices
- Accidental cable loops
- Switch resetting
- Overloaded or misbehaving devices



The Advantages to Visualizing the Plant Floor

As the plant floor becomes increasingly sophisticated and interconnected, the need is rising for plant engineers to have visibility into their entire network and simplify support all the way to the edge. Having a tool that can reduce the potential for intermittent communication disruptions, enable continuous real-time monitoring, and provide remote support can offer valuable time and cost savings to manufacturing facilities of all sizes. With tools such as IntraVUE™ software, automation and controls engineers can continuously view, analyze, diagnose, and document the plant floor to avoid issues. Industrial controls professionals can have visibility into the plant's entire Ethernet connectivity landscape where issues are occurring, and plant technicians can access the root of the problem faster, improving uptime and significantly decreasing network support costs and response times.

Smart Manufacturing Needs Smarter Monitoring and Documentation

The IoT has made your manufacturing systems smarter than ever. The more complex your manufacturing system becomes, the greater the risk. Multiplying IP addresses and more end-points often means more troubleshooting, lost time, and money.

Implementing a comprehensive tool that can reduce the potential for intermittent communication disruptions, enable continuous real-time monitoring, and provide remote support, can offer valuable time and cost savings to manufacturing facilities of all sizes today, and in the years to come.

Schedule a demo and discover how IntraVUE software can help you visualize and document your manufacturing system, prevent downtime, and save you money.



Turning Infrastructure Data into Business Value

The IoT brings together people, processes, and data to make networked connections more relevant and valuable than ever before. Technology advances are turning information into action, creating new capabilities, richer experiences and unprecedented economic opportunity for individuals, businesses, and industries.

The challenges of scaling IoT connections require the simplification of IoT deployments while addressing security and accelerating value creation.

With the implementation of IoT technology, higher value business decisions drive profitability, safety, and security such as:

- Defining your tech stack
- Collecting environmental, asset condition, and physical network performance data
- Applying data analysis and analytics
- Turning insights into actions

IoT technologies enable customers to think differently about how they can create value within their business. Panduit IoT Solutions can be rapidly deployed to collect and visualize system and device performance, condition, and environmental data from customer systems.

Visit <http://www.panduit.com/intravue> for more information.

¹ [Plant Engineering 2016 Maintenance Report](#), April 2016.

² [McKinsey Global Institute. "The Internet of Things: Mapping the Value Beyond the Hype."](#) June 2015.

³ [McGrath, Dan. Industrial Maintenance & Plant Operation. "Is Your Plant Network Helping You Avoid Downtime?."](#) (MPO), April 2017.



Since 1955, Panduit's culture of curiosity and passion for problem solving have enabled more meaningful connections between companies' business goals and their marketplace success. Panduit creates leading-edge physical, electrical, and network infrastructure solutions for enterprise-wide environments, from the data center to the telecom room, from the desktop to the plant floor. Headquartered in Tinley Park, IL, USA and operating in 112 global locations, Panduit's proven reputation for quality and technology leadership, coupled with a robust partner ecosystem, help support, sustain, and empower business growth in a connected world.

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