

Overcoming Obstacles of Industrial Network Management

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Abstract

Every industrial network has a life cycle consisting of four basic stages: installation, operation, maintenance, and diagnostics. Even with careful network planning and design, network management throughout all four stages of the industrial network lifecycle can still present many challenges for integrators and operators.

To optimize network efficiency, maximize system uptime, and minimize total cost of ownership, industrial automation networks not only require rugged hardware well suited for harsh environments, they also require user-centric software tools to enhance the user interface for efficient network deployment, monitoring, maintenance, and troubleshooting. In this white paper, we discuss the inherent obstacles of each industrial network life cycle segment, and how industrial-tailored network management software can assist you in overcoming these obstacles and reduce the total cost of ownership.

Overview

Each stage of the industrial network management life cycle—installation, operation, maintenance, and diagnostics—is not only vulnerable to human error, but also susceptible to time-consuming inefficiencies. To maintain non-stop operation, industrial engineers often need to perform countless tasks manually or use different software to run and manage the network at each stage. For example, engineers may use one utility to do troubleshooting but another piece of software to monitor the status of field devices.

Fortunately, industrial network engineers can now leverage the power of a centralized network management software suite that allows them to manage their automation network throughout the entire network life cycle. In this white paper, we investigate the management obstacles that must be overcome at each stage of the network life cycle, and explain how advanced network management software can overcome these obstacles.

The Four Stages of Industrial Network Management

1. Installation Stage

Challenge: Before every network device has been installed, system integrators need to configure and test each network node. Initially, network devices are generally configured manually, one at a time, using the devices' web console. Depending on the number of nodes to

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be configured, configuring devices manually typically requires the assistance of several engineers, and can take days, if not weeks, to complete. Besides, configuring devices manually can also give rise to human errors, and then take more time to find and fix the errors.

Solution: With **mass-configuration** software, system integrators can deploy a large number of network devices easily and efficiently. The MXconfig network configuration tool, which is included in the MXstudio network management suite, allows users to configure all network settings, including IP address, password protection, redundancy protocols, and even wireless settings, at one time, reducing the initial deployment time to next to nothing, and essentially eliminating the possibility of human error. According to our field testing, MXconfig can be used to successfully configure 100 switches in just 12 minutes, which in many cases could represent a 90% reduction in configuration time.



Figure 1: According to Moxa's own lab tests, MXconfig can significantly reduce the initial setup time compared with the traditional hands-on, one-at-a-time approach ([click to watch a demo video](#)).

2. Operation Stage

Challenge: Without proper network management software, industrial operators are unable to monitor, identify, and react to network issues immediately, which can result in production losses and safety concerns. In general, IT network management software uses complex features and sophisticated user interfaces, which not only comes with a high learning curve but is also unsuitable for use in industrial applications. However, when using industrial network management software (iNMS), you face the challenge of integrating the iNMS with the existing SCADA system or enterprise network system.

Solution: It takes automation-friendly software that allows network operators to monitor network status accurately and in real time. Moreover, it should be easy to configure the software for use with third-party network management software or SCADA systems, to give industrial operators better control of the entire networking system.

The MXview industrial network management software included in the MXstudio suite is a GUI platform that allows operators to easily monitor and manage industrial networks of up to 2000 nodes—in real time. Due to MXview's **smart visualization** feature, the software auto-detects and displays the network topology, shows color-coded VLAN/IGMP settings, and supports a

virtual device panel that displays port status, PoE power consumption, and port-level link traffic, accurate to four decimal places.

MXview supports advanced integration with existing SCADA/HMI systems as well as third-party NMSs. For SCADA systems, MXview supports a built-in OLE for Process Control (OPC) server that can integrate SNMP data to SCADA systems and alert network operators of any network anomalies. Moreover, MXview OPC server supports a unique OPC tag, called the Group Health tag, which indicates the status of the entire network using three simple levels of severity. This unique OPC tag not only reduces the tag cost for SCADA users, but also represents system-level information. Network operators can easily check the health of the network by using the unique Group Health OPC tag. For third-party NMS integration, MXview can send SNMP traps, including link down, power off, and network traffic status, to another network management platform that focuses more on end-to-end service availability rather than physical network connectivity.

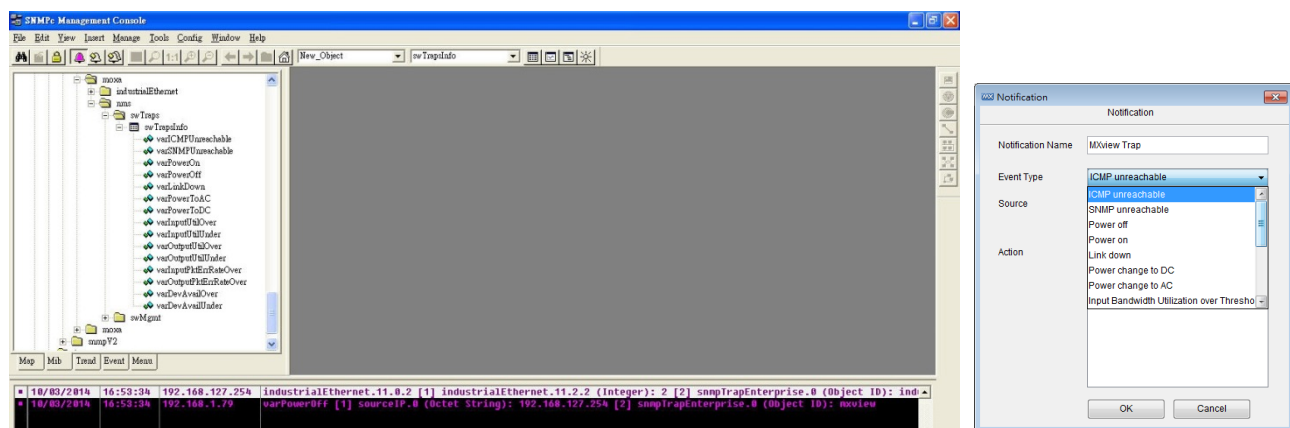


Figure 2: For third-party NMSs, MXview can send SNMP traps, including link down, power off, and network traffic status, to enterprise network management software.

3. Maintenance Stage

Challenge: During maintenance, engineers will perform various tasks, including configuration updates, backups, and firmware upgrades. Changes to device settings can sometimes cause unexpected network issues. When this happens, backup files will need to be restored to a previously known working state until network issues can be resolved. However, every update and configuration rollback for a large-scale network can be extremely time-consuming, which can translate into extended system downtimes and substantial production losses.

Solution: The industrial network management system should also serve as a central platform for configuration/firmware management. MXview's **configuration center** allows you to select a group of devices and export their configuration files simultaneously for backup, saving a significant amount of time during maintenance. You can also use the **job scheduler** to perform regular configuration backups. What's more, MXview supports comprehensive report functions, including event log history, inventory/availability reports, and device property reports, increasing the productivity of maintenance staff.

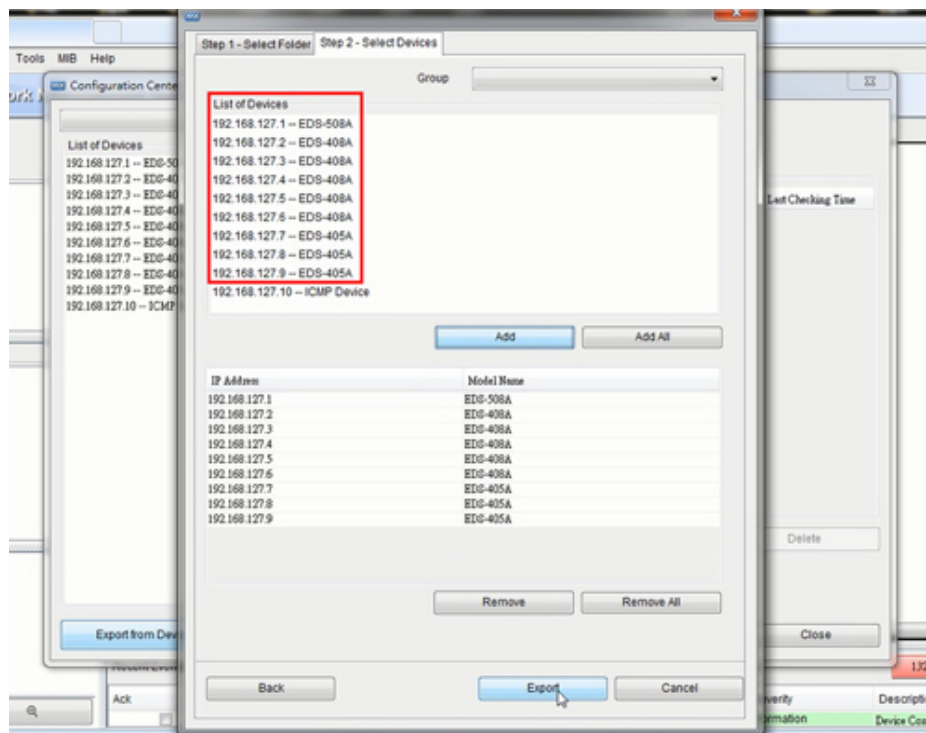


Figure 3: MXview's configuration center makes it easy to export configuration files for a group of devices, saving a lot of time on configuration backup ([learn more](#)).

4. Diagnostics Stage

Challenge: System downtime can be very costly, so network services need to be restored as quickly as possible when a problem occurs on the network. However, without knowing where to look and what to actually look for, engineers can spend hours troubleshooting the network and still fail to find a solution.

Solution: Network event details are important for engineers to quickly analyze where the problem originated, which network segments/nodes are affected, how to resolve the problem, and whether or not to send an engineer to the affected remote site. MXview supports a highly-intuitive **event playback** feature that can record network events, and replay past network incidents in the order they occurred. By selecting a specific event or a particular time frame, network status can be played back for event review, topology changes, and sequence analysis.

N-Snap, an industrial network snapshot tool provided with the MXstudio suite, allows you to collect your network status, both before and after problems arise, for comparison. Important network data captured by N-Snap includes redundancy settings, VLAN tables, IGMP tables, routing tables, and switch configurations.



Figure 4: With MXview, you can activate an event playback function to review events, traps, and any updates in your network topology. Watch the step-by-step tutorial [here](#).

Success Stories

1. Rail Application: Mass Configuration of a Railway Ethernet Backbone



A high-speed rail operator in Asia wanted to build a fiber Ethernet backbone between its railway stations and central operations management center to ensure high availability for data communications. MXconfig's **Link Sequence Detection** feature allowed the system integrator to deploy 30 Ethernet switches and complete all configurations—including IP addresses, redundancy settings, and VLAN settings—in under 30 minutes by recognizing the physical proximity of the switches on the installation rack, identifying their MAC IDs, and configuring their IP addresses automatically.

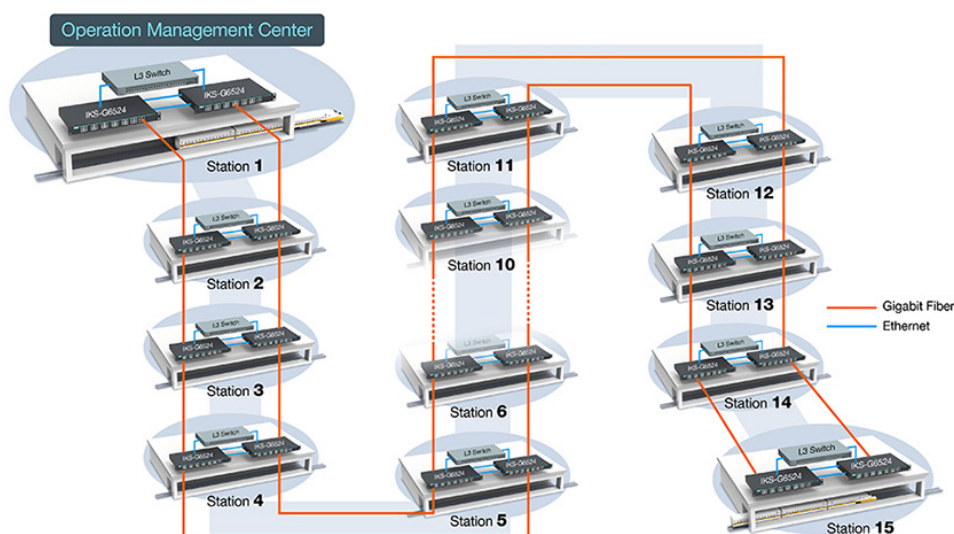


Figure 5: The MXconfig network configuration tool allowed the system integrator to deploy 30 Ethernet switches in under 30 minutes, reducing the initial deployment time for the railway operator ([learn more](#)).

2. Mining Application: Real-Time Information Convergence for Coal Mining



A major coal mining company in China is using the MXview network management software along with Ethernet devices for their real-time mining data communication system, which sends underground production and environmental conditions to an above-ground control center. Thanks to MXview's smart visualization technology, the ground staff can easily manage the entire network through an intuitive graphical network topology display that shows the health and status of each connected node.

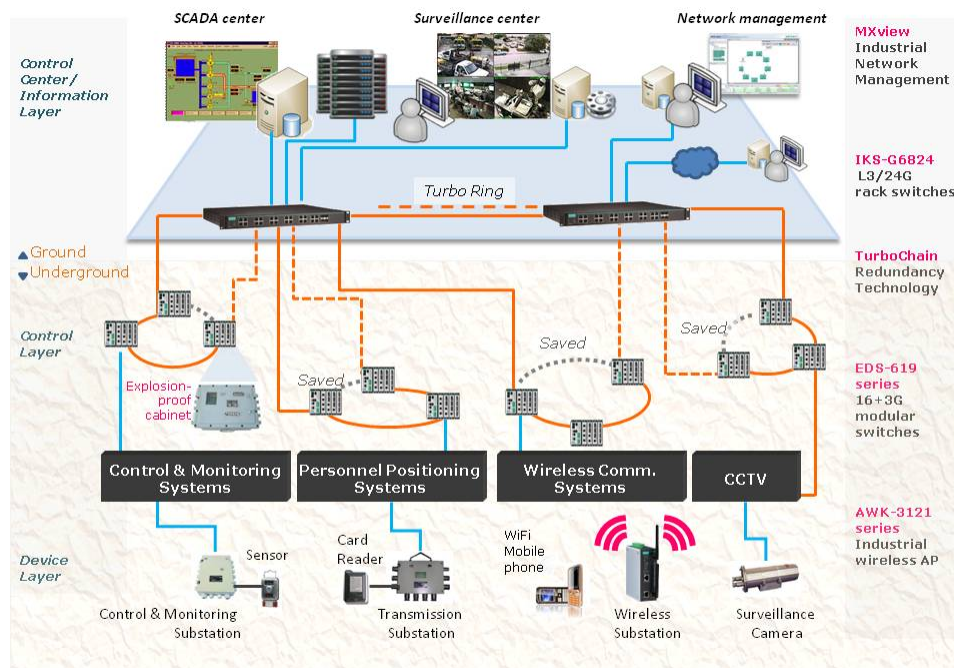


Figure 6: MXview includes real-time alarms as well as historical analysis and event playback for improved troubleshooting ([learn more](#)).

3. Transportation Application: Building an Intelligent Emergency Response System for Tunnels



Caltrans (California Department of Transportation) planned to construct the fourth bore of the Caldecott Tunnel to relieve traffic congestion. To ensure traveler safety and improve traffic efficiency within the tunnel, Caltrans installed an emergency response system, which includes fire detection equipment, video image detection (VID) cameras, and emergency stations. In addition, Caltrans also built an Operation and Maintenance

Control (OMC) center near the tunnels for continuous traffic management. The MXview industrial network management software was installed in the OMC center for network monitoring and troubleshooting. MXview visualizes all the network devices and physical connections. When a network error occurs, MXview's event playback function allows OMC staff to replay past incidents and troubleshoot accordingly, helping maintain smooth traffic flow and enhance safety.

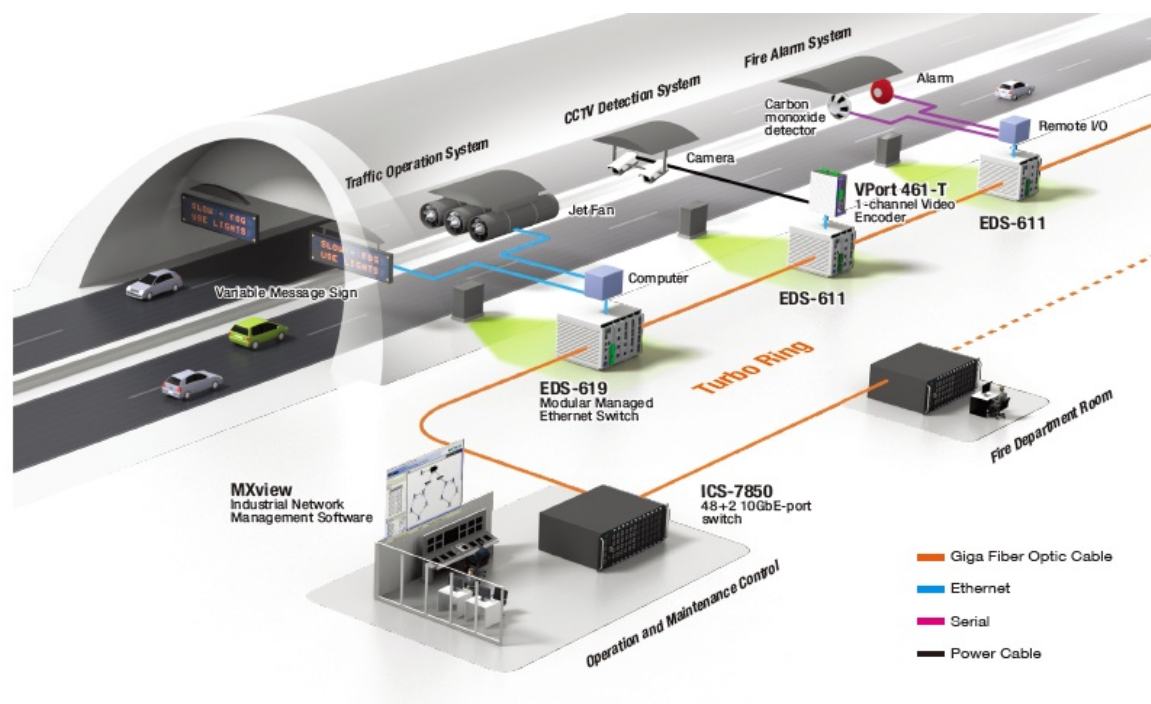


Figure 7: MXview is installed in the Operation and Maintenance Control (OMC) center next to the tunnel to help operators maintain smooth traffic flow and enhance safety ([learn more](#)).

4. Factory Automation: Collecting Real-Time Automation Network Status through SCADA

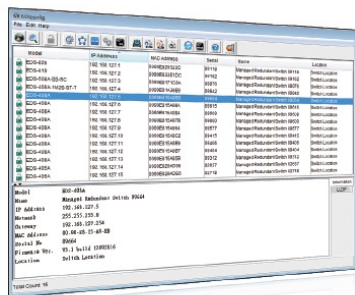


A major semiconductor manufacturer originally only used a SCADA/HMI system for PLC monitoring. When abnormalities occurred, the manufacturer had little control over network status, and had to rely on the system integrator to do on-site troubleshooting, which was both time-consuming and inefficient. However, the manufacturer did not want to replace the SCADA system as their monitoring platform. As a result, the

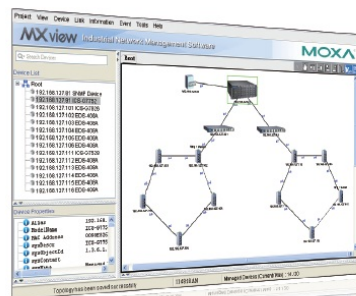
manufacturer decided to use MXview, which has a built-in OPC server that allows MXview to communicate with the existing SCADA system by sending OPC tags. In this way, automation engineers can be alerted of any status updates via the SCADA system, and then troubleshoot abnormalities immediately. Moreover, MXview analyzes the overall health of the network and sends out single "Group Health" tags to the SCADA system to alert the engineers, reducing the cost of the OPC tags.

Conclusion

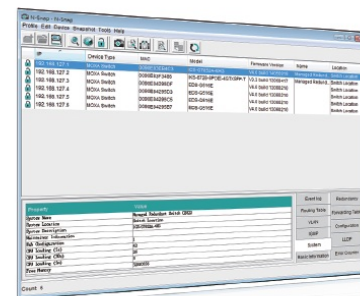
As networks continue to grow, network operators are facing a tough challenge to keep their systems up and running. Moxa's MXstudio industrial network management suite delivers three key features—easy configuration, smart visualization, and quick troubleshooting—to help engineers monitor and manage their automation network. Moreover, with this one suite, you can perform all key network management tasks for the life of the network, including installation, operation, maintenance, and diagnostics.



MXconfig
Industrial Network
Configuration Tool



MXview
Industrial Network
Management Software



N-Snap
Industrial Network
Snapshot Tool

Visit the MXstudio product site (www.moxa.com/MXstudio) for product details.

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