

WHITE PAPER MITIGATE CONTROL SYSTEM RISKS AND INEFFICIENCIES WITH A WELL-PLANNED, PHASED SCADA MODERNIZATION

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Continuing to run an outdated or obsolete supervisory control and data acquisition (SCADA) system poses many business and operational risks. While many organizations using mature or obsolete SCADA system components know they really should modernize, getting started with modernization can be difficult since there are often many internal roadblocks to navigate. This white paper aims to help you move beyond these roadblocks by covering the risks of continuing to run your mature and/or obsolete SCADA system, the many benefits of modernization, and how to minimize risk when implementing changes during a modernization.



MITIGATE CONTROL SYSTEM RISKS AND INEFFICIENCIES WITH A WELL-PLANNED, PHASED SCADA MODERNIZATION

Your supervisory control and data acquisition (SCADA) system is a key part of your organization's critical infrastructure. But when any part of this system, which includes your industrial PCs, their operating systems (OSs), and the control software running on those computers as well as your human-machine interfaces (HMIs) and programmable logic controllers (PLCs), is outdated or obsolete, there are quite a few business and operational risks your organization is likely facing. These risks can range from compatibility issues to cybersecurity threats to challenges with maintaining and supporting your systems. When your aging SCADA system is causing these types of issues, you are much more likely to experience frequent downtime and suffer from overall production inefficiencies.

While many organizations using mature or obsolete SCADA system components know they really should modernize, getting started with modernization can be difficult since there are often many internal roadblocks to navigate, including fear of prolonged downtime, budget concerns, and aversion to change. This white paper aims to help you move beyond these roadblocks by covering the risks of continuing to run your mature and/or obsolete SCADA system, the many benefits of modernization, and how to minimize risk when implementing changes during a modernization.

THE RISKS OF CONTINUING TO RUN YOUR OUTDATED SCADA SYSTEM

As mentioned, your organization is likely facing a variety of business risks as you continue to drive operations using an outdated or obsolete SCADA system. However, fearing the unknowns involved in modernizing your systems, especially when it comes to your OS and SCADA software, is common. Therefore, to continue running your legacy software, you may keep driving your SCADA systems with old industrial PCs. This is risky because when an issue inevitably occurs with the old PC and it needs to be replaced with a newer PC, you may experience compatibility issues between the newer PC and the older software versions you are relying on. While you may be able to fix compatibility issues by creating workarounds in your OS, your software still may not be able to run as intended.

Even if the new PC can run the older software, it may be challenging to get the older software version on the new PC as unsupported software versions are often not available for download from vendor websites. This may leave you searching for a disk or CD to get the correct version of the software, which may lead to a new problem of getting that software onto the newer PC as many PCs today are not equipped with CD or disk drives.

Instead of performing a full modernization, your company may elect to perform one-off updates and repairs to parts of your SCADA system as components break or reach end-of-life (EOL). For example, if a legacy industrial PC using older communication ports and protocols goes down, there are generally two options from a communications perspective to address this issue without engaging in a modernization effort.

One option is to track down another older PC that uses the same outdated communication infrastructure. However, it often costs more to acquire older parts that are compatible with your existing system than to buy new, and that is if you can even find what you need while scouring sites like eBay.

The other option is to purchase a newer computer along with adapters and converters to communicate between your outdated hardware and the new computer, which can also pose a number of complexities and risks as you try to setup this cobbled-together system. Whichever option you choose, you are now likely facing the risk of having communication issues between the older PCs and newer SCADA system hardware, or newer PCs and older SCADA system hardware.

Another risk of continuing to run an older OS is that the OS vendor will eventually stop supporting the OS through updates and patches. Not receiving critical security updates will cause a variety of cybersecurity risks to both your plant floor and your enterprise network if your OT assets are connected to the enterprise level.

From an operations, maintenance, and support perspective, there are also several risks of running an outdated SCADA system. First, as your operators, plant engineers, and maintenance staff retire or attrition naturally happens, it will become increasingly hard to find technicians who understand how to operate and maintain your aging system. Second, when legacy computers and other mature SCADA system hardware breakdown, finding the knowledge and components required to repair these systems can be challenging.

In short, continuing to run mature or obsolete SCADA systems presents many business risks to your organization including increased downtime, cybersecurity vulnerabilities, and longer downtime when issues do occur as maintenance and support for older systems is much more challenging. Let's look at how a modern SCADA system can minimize these risks.



RISK REDUCTION FACTOR 1: A MODERN SCADA SYSTEM IS LESS COSTLY AND EASIER TO MAINTAIN

As discussed above, SCADA systems that are dated, nearing obsolescence, or completely obsolete are much more difficult, and costly, to maintain. It is not only more likely that these older systems will experience maintenance issues, but when an issue does occur, it can be hard to find the right resources to address the problem. Most vendors cannot continue to invest in supporting legacy software or stocking parts for decades-old hardware. Likewise, engineers and maintenance personnel do not have the time or resources to learn the ins and outs of every SCADA software or hardware component ever made. Instead, when engineers and technicians are trained now, it is likely that they are only learning how to operate and support the most commonly used equipment. Therefore, troubleshooting SCADA system issues is a lot easier when you are using modern OSs, software, and hardware.

From a maintenance perspective, another benefit of a modernized system is that you can program sophisticated alarming and remote access capabilities for troubleshooting and support. These features make it much easier and quicker to evaluate, and sometimes even address, issues, which will result in less downtime. With remote access, it can also be less costly to troubleshoot and address some issues if you do not need to bring a vendor or technician onsite.

RISK REDUCTION FACTOR 2: NEWER SCADA TECHNOLOGIES REMOVE PRODUCTIVITY PROBLEMS

There are many ways your old SCADA system may be hindering your productivity. First, many older PCs cannot consistently connect to your industrial network (or if a PC can, it may be opening your industrial system to many cyber risks as discussed in the next section). When a PC is not continuously connected to your industrial network, you cannot communicate real-time production data that can help you take actions to optimize production or proactively identify maintenance issues. And with an outdated and unconnected SCADA system, operators may be performing manual datalogging, which may be prone to human error.

A modern SCADA system eliminates these data collection and integrity issues and opens a wide range of data collection and analysis possibilities that will make your operations more productive. You can also start taking full advantage of the benefits offered by other production-improving systems such as a manufacturing execution system (MES) or a connected enterprise resource planning (ERP) system.

Modernizing your SCADA system also enables you to experience other production improvements by making it easier to upgrade other aspects of your industrial control system. For example, if you want to optimize motor control throughout your plant by adding variable frequency drives (VFDs), it may be difficult to do if you are running an outdated SCADA system since older equipment uses different protocols and ports. But a modern SCADA system using newer industrial PCs will allow you to take advantage of the many benefits of VFDs without needing to develop communication workarounds.

Older PCs that can no longer be updated may also have issues performing SCADA system backups. This is really risky because if something catastrophic happens that causes your system to go down, and you have not been able to back-up the system recently, you could lose a lot of operational process information and data. Modern SCADA systems will eliminate this possible issue by running automatic back-up programs.

RISK REDUCTION FACTOR 3: MODERN SYSTEMS ARE MORE PROTECTED FROM CYBERSECURITY VULNERABILITIES

A modern SCADA system eliminates these data collection and integrity issues and opens a wide range of data collection and analysis possibilities that will make your operations more productive.

Today, it is nearly essential for efficient operations to connect your SCADA system to your OT network so that it can communicate with other OT and enterprise systems. While some really old systems may not even have the ability to connect to your network, perhaps the bigger risk is when you do connect your SCADA system that includes computers with an unsupported OS. This means the PC is no longer receiving critical security

updates from the vendor, and running just a single outdated PC/OS means you could be exposing your entire OT network, and potentially your enterprise network, to a number of cyber threats. Instead, the regular automatic updates modern systems receive will help protect against many of today's emerging cyber threats.

REDUCING RISKS DURING MODERNIZATION TRANSITIONS

Even if your organization is onboard with all the benefits of SCADA modernization, the looming threat of possible downtime to execute the modernization may seem daunting and be standing in the way of executing a much-needed modernization plan. This is because many organizations envision a SCADA modernization project as a rip and replace that requires a complete shutdown for days or weeks. But at George T. Hall (GTH), we understand this really is not an option for most facilities. Instead, a well-planned phased approach to modernization is a much more practical.

A Phased-Modernization for a Mining Company

One mining company we recently worked with knew it needed to modernize its aging SCADA system, but had been delaying the upgrade until they could be assured they would not experience major operational interruptions or lose any data during the modernization process. Upon contacting us, we determined that one of the biggest risks this company was facing was that it did not have a backup system in place for its now outdated and unsupported SCADA system. This system consisted of a single old PC running Windows XP, was programmed with FactoryLink SCADA software, and was using Modbus Plus to communicate with field devices.

To ensure we could seamlessly move to a new PC running an updated OS and modern SCADA software, we started this engagement by connecting a secure cell modem to the old PC. This allowed us to remotely connect to their SCADA PC while they continued normal operations. Using this technique, we unobtrusively recreated their SCADA program in AVEVA Intouch 2020 from our facility (Figure 1 & 2). At this time, we also developed a plan to upgrade communications to Modbus TCP/IP in the second phase of this modernization.

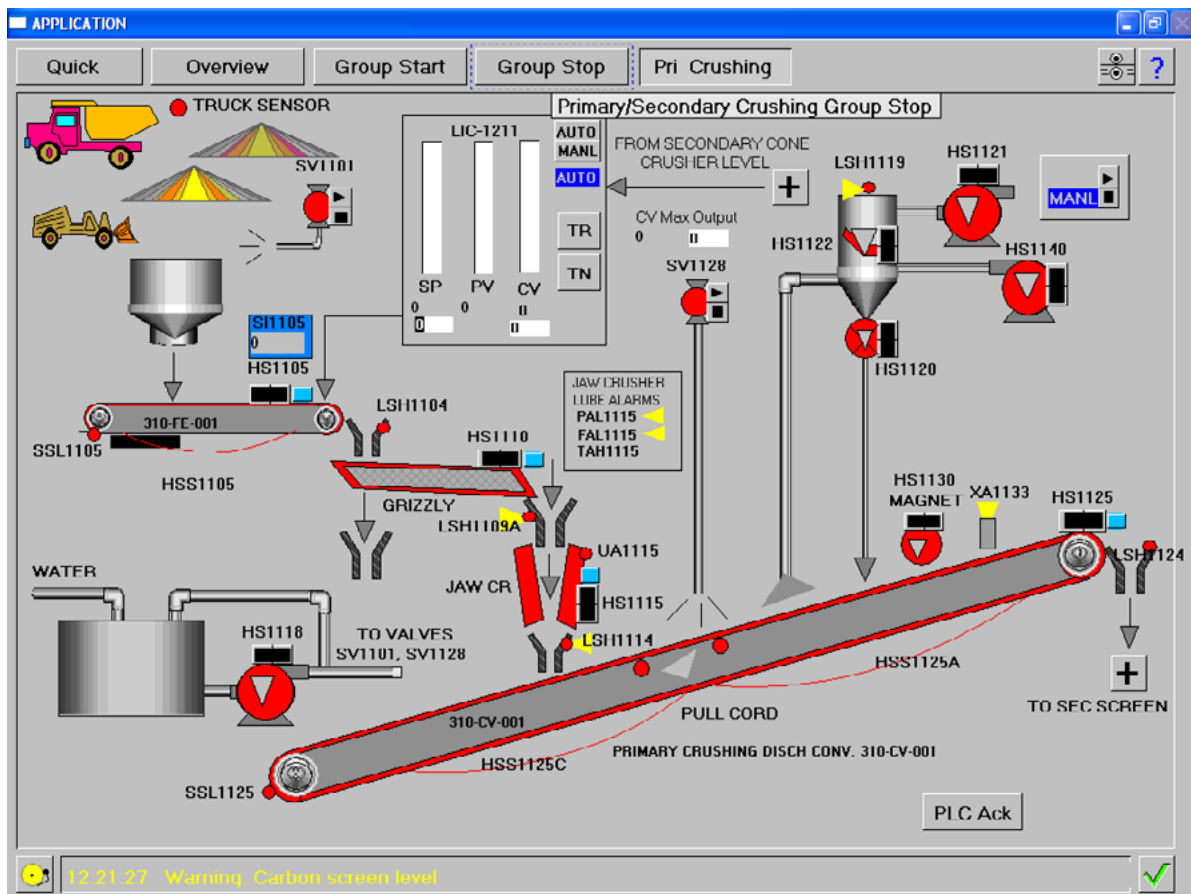


Figure 1. The customer's old SCADA software.

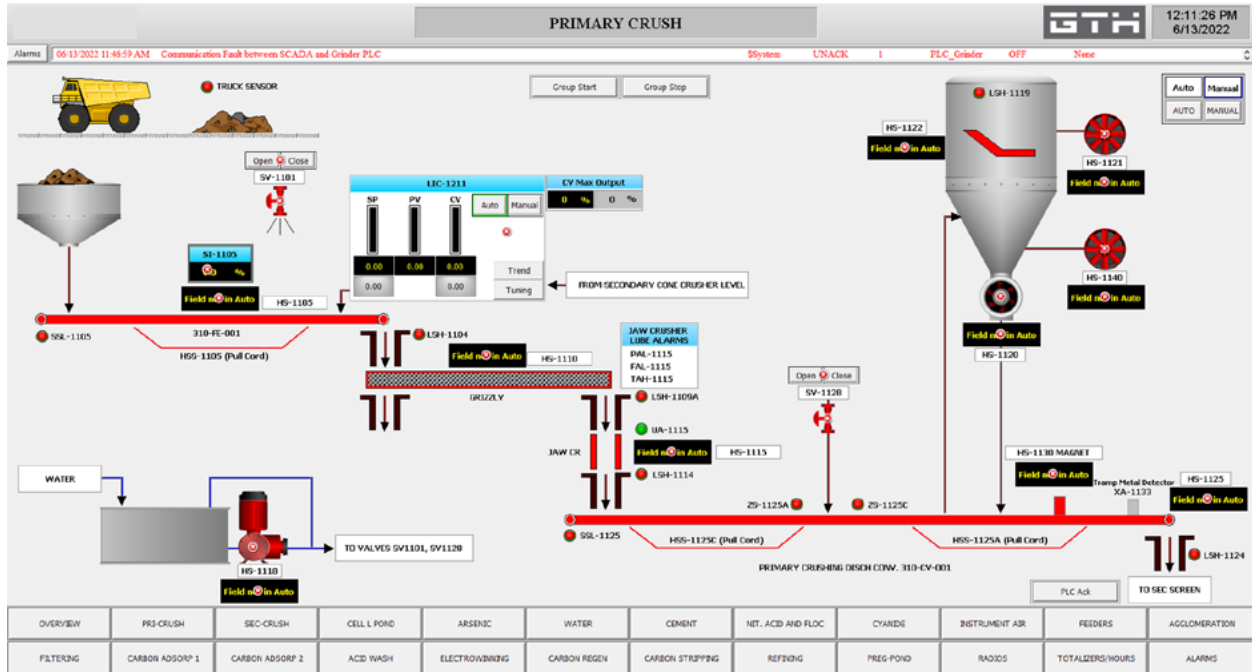


Figure 2. The new, cleaner looking SCADA software we created during the modernization.

Once the new PC with the modern SCADA software was ready, the first phase of our install involved bringing the new PC onsite. At this time, we also used the NRD Mebil Modbus Plus Module to convert the old Modbus Plus protocol to Modbus TCP (Figure 3). This way, the customer could have its new and old systems working together with the existing PLCs in place, allowing us to verify functionality onsite before taking the old system offline.

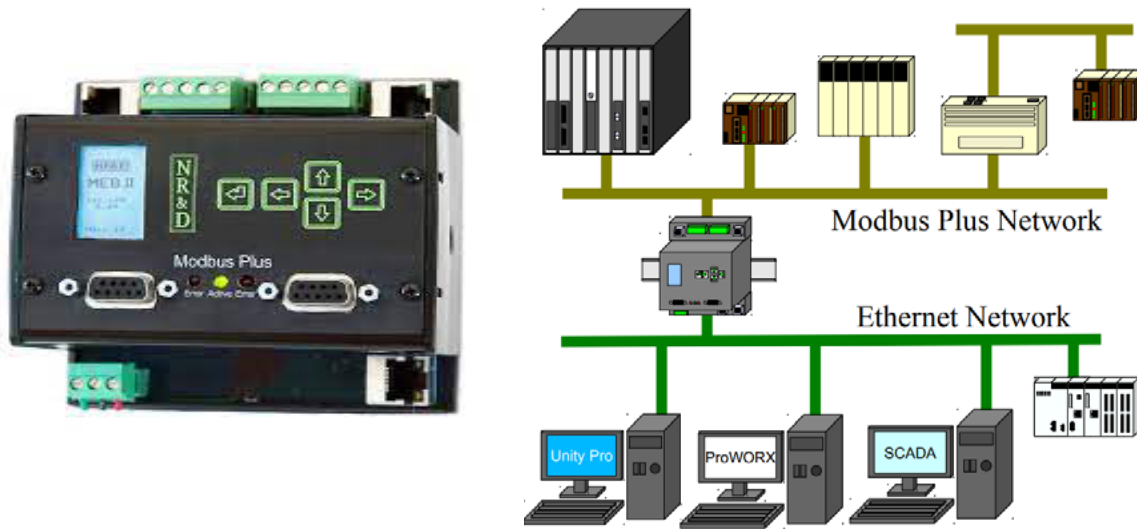


Figure 3. The image on the left shows the Mebil Modbus Plus Module we used to convert the old Modbus Plus protocol to Modbus TCP/IP and the right diagram shows a representation of how this module enabled the new network to function before we migrated to the new PLCs.

The next phase of this modernization involved the PLC migration. For this process, there were several tools we used to accelerate the migration and reduce costs and risks. First, we took the old Quantum PLC program and ran it through the Unity M580 Application Converter (UMAC) tool to ensure programming compatibility for the new M580 PLCs (Figure 4). Using this tool allowed us to reuse about 95 percent of the existing PLC programming, which was very cost effective since this greatly reduced the labor needed to program the new PLCs.



Figure 4. The image on the right shows the old Quantum PLCs and the left image shows the new M580 PLCs we migrated to.

For the final phase of this modernization plan, we upgraded the existing Quantum Series I/O to X80 I/O using Schneider Electric’s proprietary Swingarm and Quick-Fit Cable assemblies. Since, like most older systems, this system did not have existing wiring diagrams, it was hard to know exactly what the field wiring was doing, making it risky to make all new connections. By using these assemblies and reusing wiring, we reduced the amount of downtime needed and prevented wiring errors associated with manual I/O module rewiring.

Even if your organization is onboard with all the benefits of SCADA modernization, the looming threat of possible downtime to execute the modernization may seem daunting and be standing in the way of executing a much-needed modernization plan.

Throughout this phased modernization approach, we took advantage of several tools to make the entire upgrade process less risky and more efficient. First, we purposely used processes and tools that made it easy to reuse a lot of the customer’s existing code, hardware, and wiring, which reduced the time needed to implement this new system and minimized testing time. For example, with this approach we could transition to new PLCs in two to four hours, where programming a new PLC from scratch can take weeks. Additionally, since this approach uses the same logic and language operators are already familiar with, operator training time was minimized. Overall, this whole SCADA modernization process was quite efficient and minimized all the potential risks the customer was concerned with at the start of this project.

FURTHER REDUCE MODERNIZATION RISKS WITH PROVEN EXPERIENCE

While the example above describes a modernization of a smaller SCADA system, at GTH we are also well versed in modernizations for larger SCADA systems that consists of multiple PCs and PLCs as well. With the proper equipment in place, even in larger systems, the old and new parts of the system can co-exist, and we can take a phased approach to modernization that minimizes downtime and other operational and business risks. For example, we can take advantage of existing planned downtime by developing hybrid systems that allow us to use the allotted time to just replace one part of your system, such as the PLCs. When we take this approach, we ensure the remote I/O can talk to the new PLCs during the transition period and can then replace the remote I/O during the next scheduled downtime period.

Another standard part of our modernization process that helps reduce risk is performing a factory acceptance test (FAT) of the panels we provide. Once we build a panel, we put it into a production-like environment in our facility so that we know it works as intended before going onsite. We still test all parts out of the box onsite to further minimize risk, and we supplement our testing by providing extremely thorough documentation.

Additionally, we are a platform-agnostic integrator and are well-versed in working with a wide variety of software and hardware for SCADA systems. For example, we are EcoStruxure Plant Certified and a Certified Alliance System Integrator for PLC Modernization with Schneider Electric and a Registered System Integrator with AVEVA. We also have integration experience in a number of other areas, which means we can ensure every aspect of your control system is considered as we work to modernize your SCADA system. And finally, throughout our more than 90 years in business, we have developed proven methods and processes that help us further minimize downtime and risk.

With the proper equipment in place, even in larger systems, the old and new parts of the system can co-exist, and we can take a phased approach to modernization that minimizes downtime and other operational and business risks.

STOP IGNORING THE RISKS AND INEFFICIENCIES OF YOUR MATURE SCADA SYSTEM

Continuing to run mature or obsolete SCADA systems presents many business risks including increased downtime, cybersecurity vulnerabilities, and longer downtime when issues do occur as maintenance and support for older systems is much more challenging. By ignoring or delaying the need for SCADA system modernization, when one of these risks becomes a reality, you can get into a difficult situation that you may not be able to fully overcome. At GTH, our engineers are well-versed in developing solutions and modernization plans that will allow you to start experiencing the numerous benefits of a modern SCADA system while addressing the concerns your organization may have when it comes to modernization.

**Contact one of our engineers today to learn how
we can work together to develop a SCADA system
modernization plan to meet all your needs.**

CONTACT US

