Improving Automation at Remote Sites

New Technologies Eliminate Gaps in Data While Lowering Costs

Because water treatment usually involves a large geographic area, automation systems for water / wastewater applications often require remote sites. In industrial water treatment, water is typically treated immediately adjacent to its points of use, and these locations may be across large industrial complexes. In municipal applications, water often is pumped long distances across extensive areas measured in square miles. To deliver optimum results, remote automation locations must be either tightly coordinated or at a minimum monitored – which has presented some challenges in the past with regard to real-time data and event evaluation. However, advances in automation technology have provided alternatives to traditional approaches to managing these remote sites – and helped users speed implementation, reduce costs, improve data integrity and resulting treatment processes, and significantly ease accessibility.

imagination at work

Can You Hear Me Now?

Human Machine Interface (HMI) and Supervisory Control and Data Acquisition (SCADA) systems continue to be the primary technologies to support remote site management. These software solutions inherently provide a number of strong capabilities in terms of off-the-shelf visualization tools and integrated alarming capability. However, traditional HMI/SCADA applications are all based on a central location gathering data on-line from control locations (See Figure 1). All of the valuable tools are based on near-real time or live data from the control locations.

This technology is deployed with access to all remote automation locations being defined in terms of slaves or servers of data to the HMI/SCADA system. The HMI/SCADA system acts as the master or client for the data internal to the remote automation location. The architecture is designed around the HMI/SCADA master having exclusive responsibility to gather data from the remote locations and the exclusive ability to provide this valuable data to historical archives.

The logistics and/or the cost of providing a permanent on-line connection between the HMI/SCADA system and the remote locations can be prohibitive. This most often results in a coordinated intermittent data-gathering scheme. Remote locations are typically polled at managed intervals via round-robin phone techniques or intermittent wireless connections.

Water treatment benefits from improved data integrity, more valuable data for evaluation, and faster, more cost-effective automation project implementation.

By definition, this results in gaps of non-connectivity between the central location and the remote locations. There often is a large amount of engineering resources put into accounting for these gaps. Extra calculations in the controller are often performed to create averages and other statistics around process parameters. Significant data reconciliation is often necessary, since the HMI/SCADA then timestamps this collected data. This timestamp reflects the collection time not the time corresponding to the data.

Under this same discrepancy in timing, the HMI/SCADA system evaluates parameters to determine if any current or aggregated value exceeds an alarm threshold. It is actually

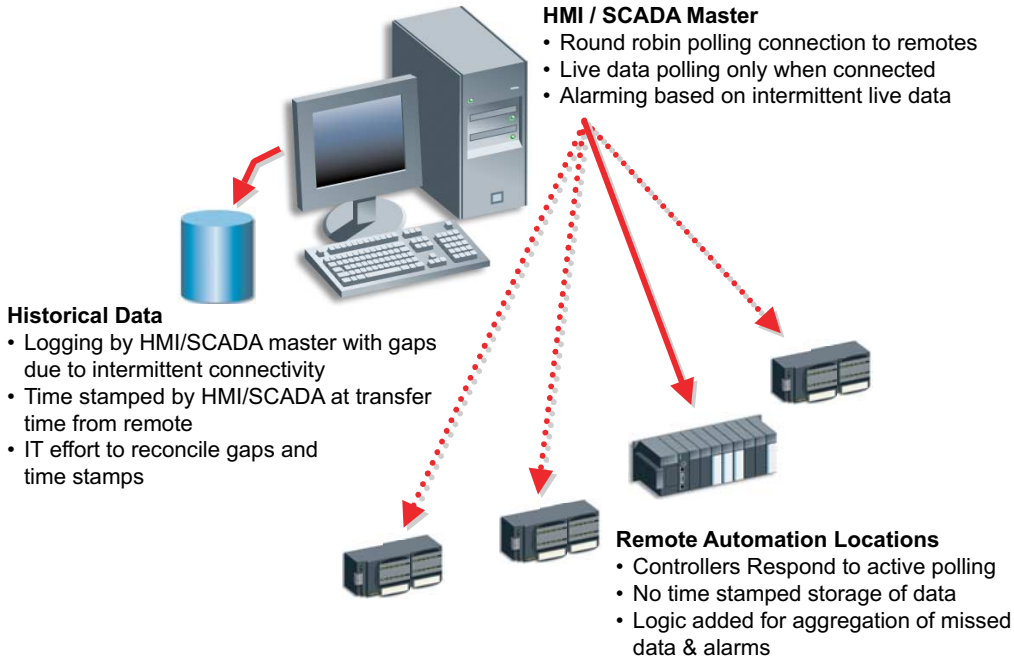

Figure 1: Simplified view of a legacy HMI/SCADA data collection and storage architecture

likely that alarms happened during periods on non-connection. Intermittent alarm conditions can be missed. This time lag in evaluation can result in a recorded alarm record with a time-stamp that will be skewed from the actual alarming occurrence.

Going Remote

Automation at the remote location is first and foremost designed to meet the local control and monitoring needs of the application. These remote locations are typically manned only sporadically and thus must be autonomous. Access to the data from these remote automation locations has become more critical to the greater system and has influenced the technology deployed to meet these challenges.

Controller capability has moved beyond the "black box" era. Although these remote locations may be manned only occasionally, there is a need to provide complete operator interface capability. Whether it is a remote pumping station or one of many chemical delivery units inside a larger plant, operators will expect to interact with the process when they need to. This will involve complete access to current values of process parameters, any alarm instances, and the ability to perform setpoints and take action.

Rather than using a separate operator interface device connected to a dedicated controller, users have begun to deploy industrial computers with integrated control based on a standard computing technology. These units based on the Microsoft® CE Operating System combine the best of the PC with the hardened form factor of the PLC. These devices are very flexible and include a configurable touch screen interface that allows for customization to the application. The local application will provide a complete visualization and alarming solution that is tightly integrated into the control logic resident on the same device. These devices are Ethernet centric even if remotely located and can provide inherent web-publishing capabilities that become an integral part of the overall solution.

No Loop-Polls

The advent of standard computing technology to these remote automation locations has an impact on how designers are architecting the overall system (See Figure 2). These CE-based controllers have access to standard low-cost memory capability and thus have the capacity to store larger amounts of recorded data local to the application. These controllers typically have a resident storage capacity in of 32 MG and Compact flash expansion port for additional storage. At a minimum, this data can be used to provide the local operator with insights into longer periods of process history for evaluation and action.

This expanded local storage allows for more raw data to be captured and stored in standard formats. This data can be time-stamped at the time of collection for the

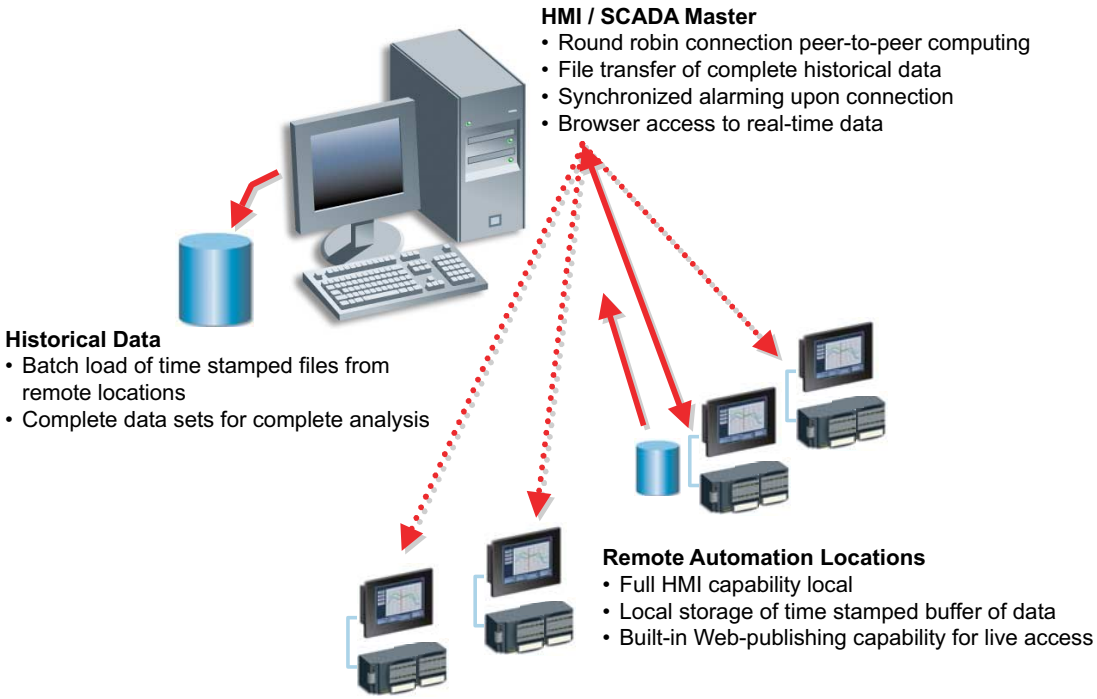

Figure 2: Simplified view of alternative architecture designed to deliver higher data capability

clearest and simplest way of labeling the data. There is no manipulation of the data necessary to compact it or artificially aggregate it.

The polling sequence from the centralized HMI/SCADA system can be designed to be a connectivity sequence rather than a polling sequence. The central system can establish a connection to the remote automation location that is not intended to pass the "current" value of process parameters. Instead, the centralized system uses standard computing capability to copy the raw data files that completely describe the disconnected period in the absolute best terms. The data is then loaded into a central historian, which provides a comprehensive history of all aspects of the system.

The centralized HMI/SCADA system will not be required to poll the memory map of the local controller. Alternatively, the central system will synchronize alarm and event databases to allow for the passage of locally time-stamped alarms to the central system. These alarms will reflect the actual timestamp of the alarm condition, and no alarms or events will be missed due to the intermittent connections.

Finally, users at the central location can access the same screens that are local to the application. The CE-based device publishes the graphic screens and can be accessed through standard web browsers such as Microsoft® Internet Explorer or Netscape®. This allows for the optimum insight into local operating conditions without pre-configuration of access or excess coordination of central and remote setup.

Windows CE-based controllers have access to standard low-cost memory capability and thus have the capacity to store larger amounts of recorded data local to the application and facilitate accessibility through standard web browsers.

Water treatment often involves a large geographic area, requiring remote automation sites.

Better Data, Lower Implementation Costs

The simple change in the access of remote automation locations delivers significant benefits to both large and small systems. The data integrity is better and the data inherently more valuable for evaluation due to the collection of complete data sets. Access to real-time status and action can be executed on demand from standard browsers with no intermediate technology. And finally, systems can be deployed more swiftly and effectively by reducing the engineering around the intermittent live connection.

For more information focused on the value that GE Fanuc can bring to water applications please visit **www.gefanuc.com/water**.

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