Remote MMIs – DCS MMIs Displayed on Remote PCs

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Abstract

Companies continue to spend an increasing amount of money in the development of efficient customized DCS screens. The benefits from the time and effort spent in developing these screens can be expanded beyond the limited use by the control room personnel. With the technology available today, it is possible to interface with the DCS systems to allow for real-time data display of DCS custom screens on remote PCs. This remote MMI capability will be useful for providing plant engineers, plant managers, technicians, or home office personal a familiar way of viewing plant data.

Introduction

There often exists a need for displaying real-time, custom distributed control system (DCS) screens in areas other than a control room. Plant engineers may want to look at DCS screens from their office. Typically, I&C shop personnel have customized DCS screens designed for their own uses and need access to these screens without competing with control room operators. In addition, plant specialists may need to monitor several plants from a common office, or from remote PCs at home, or on the road. A case example may be when the plant operation staff is seeking the advice of their performance engineering staff to resolve a plant transient irregularity. With the aid of a PC-based remote man-machine-interface (MMI), the performance group would be able to immediately observe the same plant anomaly and could interactively assist in resolving the problem. The technology developed for emulated DCS simulations can be applied to meet these needs efficiently.

One of the major criterion for an emulated DCS graphic screen is to be capable of realistic, real-time updates, without requiring large amounts of network traffic. Thus, a well-designed emulated graphic screen could be used to display real plant data efficiently. In the case of a computer simulation of a process, the MMI screens request data from a server connected to a process model. In the case of the remote MMI, the MMI screen requests data from a computer connected to a DCS gateway. Thus, the remote MMI PC would load the emulated DCS screen and transmit a variable list request to the host computer over the company's internal network (or a standard phone line). The host computer would communicate this request, translating as necessary, to the DCS gateway. Figure 1, below, presents an example of a network layout where the DCS is a Honeywell TDC 3000.

Figure 1. Network Configuration

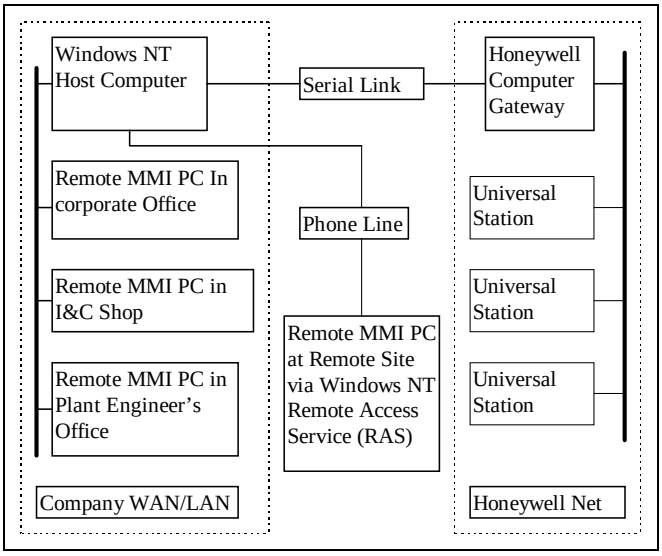
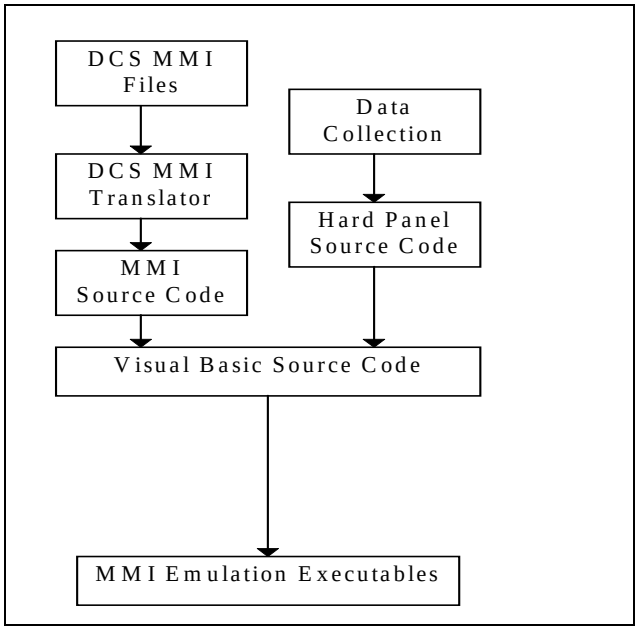


Figure 2. The Translation Process



Methodology for Creating Remote MMI Screens

The first step in creating the remote MMI screens for the Honeywell TDC 3000 DCS is to translate the graphic screens from the DCS, as presented in Figure 2. This step involves obtaining a PC version of the DCS graphical configuration files. These files are then used by the Framatome Technologies Honeywell graphic translator to generate Microsoft's Visual Basic executable programs that can be used on any standard Windows PC (See Figures 3 & 4 for sample screens). The Visual Basic executables would emulate the MMI screens and would team with an MMI manager on the same PC to coordinate the communications effort. The MMI manager handles all network communications to the host computer.

Reference 1 discusses Framatome Technologies' MMI translators for both the Honeywell TDC 3000 and Westinghouse WDPF MMIs. The MMI graphics translator finds and translates all hot-spots, variable tag names, and display control logic information. Any code in the files that changes attributes such as color, highlighting, and blinking at run-time is automatically converted to Visual Basic source code. The MMI shape libraries, if applicapable, are read to create any custom user-defined shapes needed for the MMI screens. All of the sub-picture and change-zone information is recovered from the DCS files. These MMI translators are highly automated and typically require no manual touch-up to the MMI screens. Users can create new screens from scratch or modify the source code output from the DCS MMI translator. If there is interest to create hard panel emulation for a remote MMI application, the same high-level Visual Basic interface is available to create custom hard panel representations. Visual Basic supports the loading of digital or scanned images and the creation of hot spots in an easy to use environment.

The last step for implementing a remote MMI is to connect a Windows NT PC to a Honeywell computer gateway, and install the host software provided by Framatome Technologies. After the computer gateway is successfully installed on the Honeywell side, the communications link would be established, and the remote MMI screens would be functional.

Communication Process

Several methods exist for communicating the necessary plant information from the host computer to the remote MMI screens. One of the most efficient methods of communications is TCP/IP sockets (or on Windows PCs, Windows sockets). With the win-socket approach, it is possible to provide the communication link over the Internet, the local network, or over standard phone lines. Other possibilities include named pipes, remote procedure calls (RPC), or object linking and embedding (OLE) automation. No mater what communication link is used, care must be taken to design an efficient communication technique to ensure acceptable performance over low-bandwidth links (phone lines). The current Framatome Technologies design uses both TCP/IP and named pipes. Together, these two communication techniques provide fast, reliable communications between the host and remote computers and affords acceptable operation over phone lines with a 9600 baud modem.

Security

Any true translation of the DCS files would produce fully functional screens. Care must be taken to ensure that control of the plant is allowed only in designated areas. In such instances, security concerns can be addressed in several ways. The first approach would be to take advantage of the vendor-specific security measures by configuring the computer gateway to only retrieve data. The second approach is to ignore all set requests coming into the host computer. Together, these measures are sufficient to ensure security.

Network Issues

Of particular importance on a product of this type is network overhead on the DCS system. When a screen is loaded on a remote PC, the current value of each variable must be requested from and eventually transmitted over the DCS network. There is a potential for too many variable requests, or too frequent variable requests, that will overload the DCS network and cause system problems. The threat of network overload can be minimized with proper throttling mechanisms on the interface hardware. For instance, update intervals can be scheduled for once every 15 or 20 seconds (instead of every few seconds) or the variable requests per time interval could be limited to prevent burdening the DCS network.

Conclusion

The remote MMI concept affords several advantages compared with traditional methods of providing plant information to locations other than the control room. First, most other methods are good for what they were designed to do, acquire data. The remote MMI concept, however, provides the user with the information in the format in which the operator sees the information. Second, since the executables reside on the client computer, only variable updates need be passed from the host computer to the client computer, thus allowing for operation over low-bandwidth lines. Also the PCs that can be used for the remote MMI applications are readily available at many locations away from the plant site and the cost is significantly less than the cost for a typical DCS operator station.

Another big advantage of the remote MMI concept is in using the software tools for purposes other than translated MMI screens. The remote MMI screens are, as mentioned above, Visual Basic executables. As such, there exists a set of standard calls that Visual Basic uses to request information from the DCS system. This feature provides the owner of the remote MMI software a full featured, easy to use programming interface to the DCS hardware.

Remote MMI users could write Visual Basic programs to monitor DCS variables and suggest corrective courses of action or lower cost alternatives for the operators to use. For example, an intelligent monitoring program can be running in the control room on a computer configured with the remote MMI software. This program can be configured to monitor various plant parameters, for example, de-mineralized water usage. When the usage exceeds a normal value, the program would start up the appropriate MMI screen, point out to the operator the increased usage, and suggest a corrective course of action. The power and benefit of this type of intelligent monitoring software is enormous.

References

1. C.A. Jones, C. McKim, W.T. Sneed, R.B. Brownell, S.S. Godbole, G.F. Malan, and J. Witkowski, *Distributed Control System Emulation for the Bergen Re-Powering Project Training Simulator,* Simulators International XII - Fossil Simulator User Group Meeting; April 1995.

Figure 3. Sample Translated TDC 3000 Screen

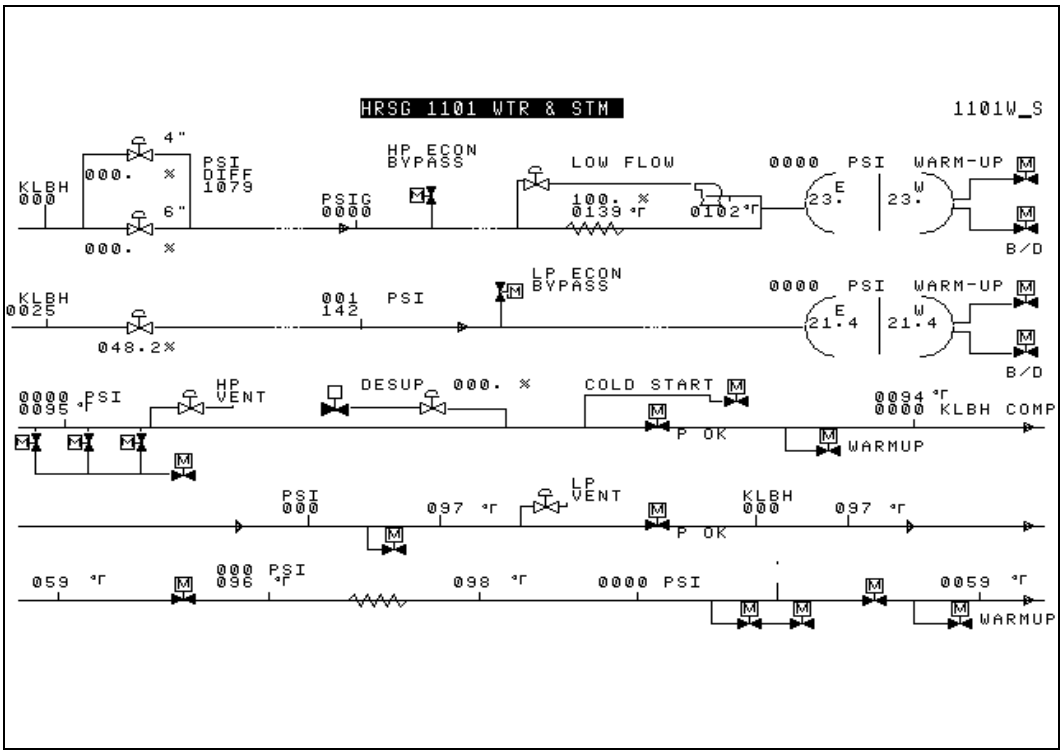


Figure 4. Sample Translated TDC 3000 Screen