
USER GUIDE EASES DEVICE MANAGEMENT FOR OPERATIONAL OPTIMIZATION

Putting FDT Technology to Work – Management of Multiple Smart Devices

OVERVIEW

Let's get connected! Thanks to the internet, we can now connect in ways we never dreamed about – social media, automobiles, home appliances, security systems, and the list goes on. And, if the fortune tellers are right, we haven't seen anything yet! What is the common characteristic in all of the mentioned scenarios is that they all include “smart” devices that communicate with each other and/or within a system to help optimize their value and deliverable.

This paper is a user guide to optimize smart device management by looking at the benefits of connecting to the information in smart measurement and control devices (one point at a time or thousands of points) for process and/or factory automation applications markets utilizing FDT Technology. With full user driven scalability options, plant operations and maintenance efforts will benefit from– lowering maintenance cost, reducing unscheduled downtime and improving compliance to new safety and environmental regulations.

LET'S CONNECT

The majority of devices deployed today are smart digital devices meaning they have the ability to communicate their information including device and process diagnostics. By connecting and integrating this information from your intelligent measurement and control devices with control, asset management, safety, configuration and other host applications, you enable improved operation optimization. With these new devices deployed in the traditional practice, you may *think* you are connected because the device is attached to the control or monitoring system using only the 4-20mA output. Not completely correct! The 4-20 control loop only provides the primary variable (PV) value and leaves you disconnected from the intelligent information in the smart device.

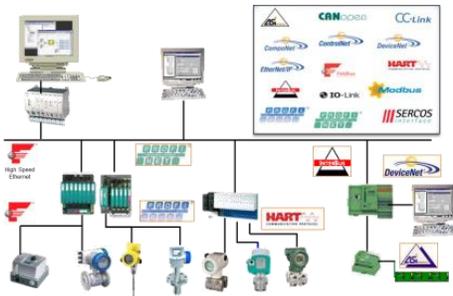
What you aren't receiving and excluding is access to the information available from your devices that may help optimize your plant operations – lowering maintenance cost, reducing unscheduled downtime and improving compliance to new safety and environmental regulations.

In our paper, [*Users Guide Eases Device Management and Maintenance Practices*](#), we provided a guide to accessing intelligent device configuration, diagnostics and troubleshooting one device at a time. This paper guides you through the options that enable simultaneous access to valuable intelligent device information from multiple devices.

Regardless of your number of inputs or the age and capability of your existing control system, there are many cost-effective products that provide access to valuable device and process information. Let's look at the different options, what they do, how they do it, how to use them and what benefits they deliver.

ENABLING TECHNOLOGY

FDT is the enabling technology that allows access of maintenance and operation information from your smart device to the configuration application, asset management system, control or other host / enterprise applications. It provides the means to generate giant leaps in plant performance and capabilities. [FDT Technology](#) is embedded in over 40 standalone configuration applications and major host/asset management systems, along with 8000 devices supported by certified [DTMs](#) (similar to a device driver). Together, they enable access to information in your devices which in turn enables you to significantly change the way you operate and maintain your plant.



Smart devices connect to systems using many solutions and many automation protocols supported by FDT Technology for device information integration.

Most intelligent or “smart” devices (like smart phones and computers) are delivered to you with enabling technology. The benefit of the technology to you varies depending on the extent of use and action taken on the conveyed information. If we expect to get significant improvements in operations, we need to change the way we think of our devices. One of the easiest things for you to do is to make use of ALL available assets to their full capabilities. This includes the information in your installed smart devices.

REPLACE, UPGRADE OR OPTIMIZE

A large majority of installed control systems will not be upgraded or replaced in the near future. The [ARC Advisory Group estimates](#) that the combined value of the installed base of automation systems now reaching the end of their useful lives (more than 20 years old) is approximated at \$65 billion. If you happen to be one of the lucky ones to upgrade, be sure to specify the ability to communicate with your smart devices by getting I/O that provides device information access using one of the internationally standardized process field communication protocols – like [FOUNDATION™ fieldbus](#) (FF), [HART@ Communication](#), [PROFIBUS](#) or one of the factory protocols like [PROFINET](#), [DeviceNet](#), [IO Link](#) and more. Other than HART, the protocols listed above are all-digital where device information is already available and should be used.

For the rest of you, consider optimizing what you have. You will need a strategy to guide you through the selection process of how to get information into or around legacy systems that are often blamed for the “we have to live with what we got” defeatist strategy.

OPTIMIZATION OPTIONS

There are a few options to consider when developing your own strategy:

- Access the information from the device and integrate it into your existing systems that can accept the integrated information.
- Access the information and create a new “stand alone” configuration, asset management or other host systems separate of the control system.

- Access the information and deliver it to a higher level or enterprise-wide system – typically using an internet protocol or Wi-Fi.

In all cases, you will need an application for field devices that provides interface access to the device information. Since there are many to choose from, select one that is easy to use, protocol independent, device and system independent and is scalable so that you can start out small and expand as you experience the real benefits and value of connecting with the information in your intelligent devices. There are more than 40 FDT enabled device configuration or asset management applications available today ranging in price, flexibility and capability. Your automation partners can help you select the right application for your specific situation.

Next, you will need access to the information. This is done using one or more of the solutions mentioned below. Since FF and PROFIBUS deliver device information as part of their all-digital protocol, we will limit our discussion to HART enabled devices which makes up the largest share of the installed smart devices.

Multiplexers

A multiplexer is used to connect the information in [HART field devices to asset management](#) systems while maintaining the 4-20mA signal into the existing control system. The multiplexer acts like a gateway device, routing communications between the software application (which might reside on a maintenance workstation PC) and the HART field devices. It interrogates each device, retrieves device information, and stores it in an internal database. This information is displayed and made available by the workstation PC running the asset management or configuration application. The multiplexer also acts as a message coordinator for communication between the maintenance workstation PC and the HART devices.

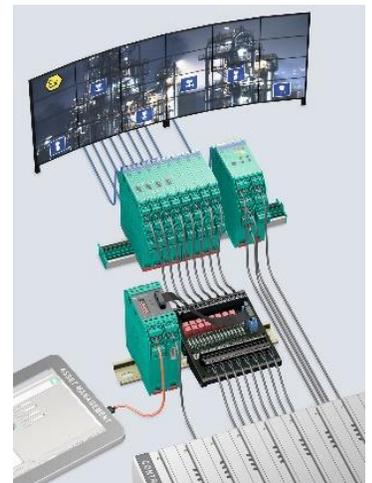


Phoenix Contact Multiplexer

With most multiplexers, the smart information from the device is “lifted” off of the 4-20mA wires and is delivered to the application using Ethernet, Modbus RTU or TCP/IP, HART-IP, wireless or other network communication. Work must be done to insert the multiplexer in the 4-20mA wiring. Once complete however, the control system continues to operate using the 4-20mA signal but a new “stand alone” or separate system is created. Multiplexers are very scalable - from a few inputs to thousands of inputs.

As you search for multiplexers, here are a few product features you should consider:

- Supports the HART versions 5-7 protocol for online configuration and diagnostics
- Provides your required output – RS485, Modbus TCP/IP, HART-IP, Ethernet
- Supports your required number of inputs per unit and number of multiplexers on one output bus – multiplexers can be daisy-chained together



Multiplexer by Pepperl+Fuchs shown with signal wires going in and then out to control system with smart information going to the tablet (or PC) application.

- Meets your area classification for multiplexer location and available options
- Includes one HART modem per channel (for faster and simultaneous scanning)
- Provides electrical isolation between channels, output and power supply
- Option to provide device power (if required)
- Wiring options – direct wire or interface terminal board for easy connection
- Make sure the product is FDT enabled (with the appropriate DTM)

Remote I/O

Remote I/O, as the name implies, enables the device wires to terminate at a remote location, eliminating the need to have long runs of multi-conductor cables back to the control cabinets. Remote I/O products are available for use in I/S or hazardous areas. And, most include a wide range of communication protocols (like FF, Modbus RTU, Profibus DP, HART, Modbus TCP, ProfiNet, etc.) that communicate back to the main control system and powerful DTMs that provide the interface to the system and allow communication down to the device level. Remote I/O units can be configured to include combinations of analog In/Out, digital In/Out, temperature modules and more.

Access to field device information includes all measurement variables, device diagnostics, troubleshooting, remote configuration, etc. Many of the product features mentioned above for your selection of multiplexers also applies to Remote I/O solutions.

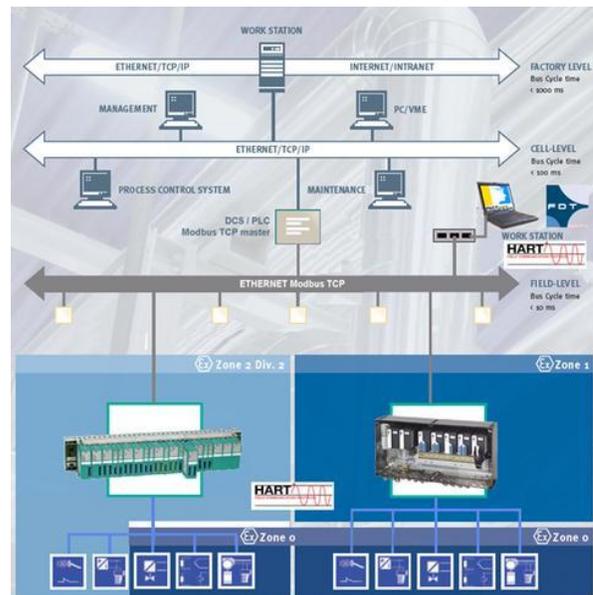


Image shows Remote I/O products by Yokogawa in different zone areas with devices connected in the field and device and diagnostic information integrated with systems.



Remote I/O by R. STAHL offers PROFIBUS redundancy and DTM support and is approved for explosive area.

Unlike multiplexers, the device wires terminate at the Remote I/O and only digital communication information is communicated back to the control system. This product is perfect for a cost-effective solution for adding new inputs into a system that might be at full I/O capacity. This solution is also used to free up capacity in the existing system for new critical required control measurements by moving “monitoring only” measurements to the Remote I/O.

Wireless Gateways

A wireless gateway is another cost-effective solution for both existing smart devices and new smart devices that might be required for regulatory compliance including hard to reach, remote applications like tank farms or pipelines. The industrial wireless standards today include

[WirelessHART®](#) and [ISA100](#) and are [IEC approved](#) and designed to work well in electrically noisy and harsh process environments.

A wireless gateway can be thought of as a kind of remote I/O or data concentrator because the gateway can be located in the field, close to many measurements which can be 100+ inputs per gateway. The output of the gateway can be Ethernet, Modbus, HART-IP or even wireless communicating back to the control room. The information can then be integrated into the control, configuration or asset management system.



WirelessHART using mesh network technology.

The inputs to the gateway are wireless and can be from two sources. First there is the wireless device which is typically battery or line powered and communicates its information wirelessly to the gateway. This is a very cost effective solution for new measurements because it eliminates the cost of running wire, engineering drawings, and junction boxes as well as reduces the time it takes to get the measurement on-line.

The second source is from a wireless adapter (may also be considered to be a router or a repeater) that connects to an existing wired smart device (or anywhere on the 4-20mA loop) and communicates device information to the gateway for transmission to the control or asset management application. Basically, an adapter converts a wired device to a wireless device and can be battery or loop powered. One adapter may communicate device information from multiple devices and facilitates two-way communication.



Wireless Adapter by E+H provides wireless access to a wired device.

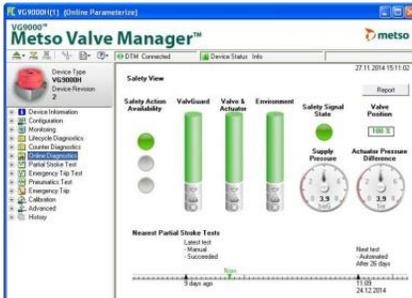
The success and benefits of a wireless application are well documented. In addition to being very cost-effective, users report wireless to be simple to use, very reliable and extremely flexible. This solution provides yet another alternative to getting connected to intelligent information available from your installed smart devices. Many wireless devices have FDT DTMs available to make device information very easy to access and use.

GETTING STARTED

Start small – identify and define a small project that can produce quick success with big benefits and payback. Then, get educated on the different options mentioned above by speaking with your device or automation suppliers. Also, be sure to get management support and team buy-in so that you increase your chances of success. Once the project is approved, select, purchase and install the solution and be sure to monitor, document the results and then communicate the success with the team. Be sure to ask for an FDT-enabled asset management or device configuration application and device [DTMs](#). There are many to choose from starting at no cost with limited capability.

Once you have identified a project, created your team and selected your “get connected” strategy, you’ll be on your way to connecting to the valuable information in your devices enabling your operation to be optimized.

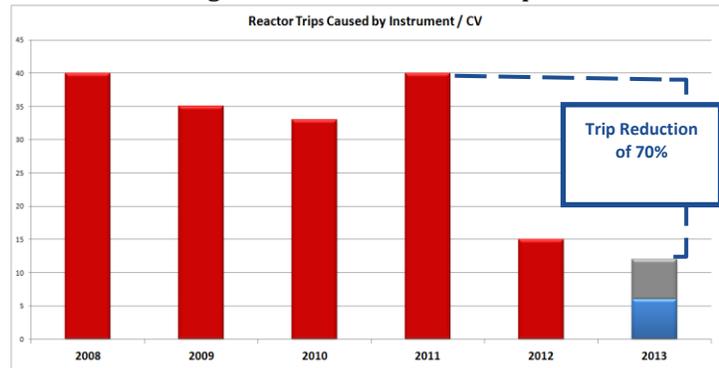
THE VALUE OF INTELLIGENCE DEVICE INFORMATION



This DTM by Metso provides an easy to read graphical interface to help you migrate to a predictive maintenance

The information in your smart measurement and control devices includes device configuration, remote access, diagnostics, troubleshooting and in some cases, application and measurement support. Most devices provide multiple measurements from a single device, math and compensation capability, alarms and alerts, valve position feedback and even collection and analysis of data such as echo curves or valve performance profiles. Using a smart device that has an FDT DTM as shown, provides a graphical interface of the device status and key diagnostic information to help you optimize the operation and transition from a schedule maintenance to a [predictive maintenance strategy](#).

When used effectively, this information can significantly reduce maintenance cost, reduce unscheduled shutdowns and shutdown duration, and much more. For example, rather than remove valves for maintenance during a shutdown based on a pre-determined schedule, communicate with each control valve positioner to determine if maintenance is needed. Users report a significant savings in “not” doing the work that is “not” required. Start small! The results shown in the chart to the right were obtained by just going after what was called their “[low hanging fruit](#)”. In other cases, shutdowns have been avoided when diagnostic information is used to identify a pending problem early enough to avoid the unplanned and costly shutdown.



Your actual experience may vary and depends on how often you review your device information and the action that you take to avoid potential problems. Having predictive information and not taking any action does not produce a big ROI.

PUT DEVICE INFORMATION TO WORK

With many ways to connect to the information sitting in your devices, you are sure to find an application and products to fit your needs. As you prepare to expand the horizon of device information and network integration within your plant, including FDT Technology. It will enable you to begin to contribute to the industrial internet of things to get the right information, at the right time, into the right hands so that the right decisions and actions can be initiated. Optimize your existing facilities and ask your automation providers for their FDT-enabled products – your most cost effective, easy to use, and low-risk solutions.

For more information on FDT Technology visit www.fdtgroup.org.

HART, FF and Profibus and other brand names are property of their respective organizations