INTELLIGENT DEVICES UNLEASHED

EDDL is the universally accepted and established industry standard for integrating intelligent field devices with systems. *Ron Helson*, Executive Director, HART Communication Foundation explains how device manufacturers can leverage on enhanced EDDL capabilities.

Information is a valuable resource and the intelligent field devices employed in process plants today contain untold riches. Valuable information that has been just beyond your grasp is now available in an easy-to-understand format. Integrating smart field devices into DCS and process automation systems plays a key role in modern asset management as it unlocks the advanced capabilities and diagnostics in these devices to provide valuable information for plant operators.

The recently enhanced international standard Device Description Language (IEC 61804 - EDDL) is the key to accessing the information, utilising the full capabilities and maximising the benefits from smart devices in your plant. EDDL is the universally accepted and established industry standard for integrating intelligent field devices with systems and is supported by device and automation system suppliers, the HART Communication Foundation (HCF) and other major fieldbus organisations.

"The ultimate goal of chemical plant operations is to have a plant that is safe, reliable, and optimised. EDDL helps provide all three," says Mark Schumacher, Vice President and General Manager Emerson Process Management and member of the HCF Board of Directors. "Some of the capability is in tried and true features that have been supported by EDDL for years, and some of the capability is in the newest enhancements to EDDL."

EDDL is a text-based language used by device manufacturers to create Device Description (DD) files providing a standardised format and structure for host systems to access and display information from intelligent devices. The HART Communication Foundation has a long history with Device Description Language and cooperates with FF, Profibus and OPC to advance the technology and maintain the standard.

New Capabilities

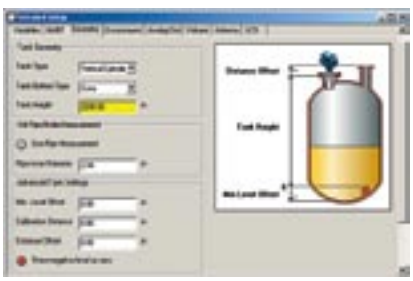
"The latest EDDL enhancements give the operator a structured and uniform view of his field assets with a consistent unified user interface for all devices," says Hans Georg Kumpfmüller, President of Siemens Process Instrumentation, member of the HCF Board of Directors and chairman of the EDDL Cooperation Team (ECT). "EDDL supports the full range of intelligent devices, from simple to very complex, and host applications from handheld tools to asset management systems in the high end DCS environment."

New EDDL capabilities include improved Windows-style data visualisation and display capabilities, standardised methods to store, retrieve and display device performance information, and enhanced tools for high-level information display in control systems. These new capabilities are powerful tools for visualising the data in intelligent devices and presenting it as valuable information for operators and maintenance personnel.

"There is an old saying, 'a picture is worth a thousand words'. EDDL enhancements such as conditional images, charts and graphs, make it easier for plant personnel to correctly spot and head off problems before they become critical and impact plant operations," Schumacher says. "This helps plant personnel prevent abnormal situations, instead of just managing them after they occur."

The EDDL enhancements enable device manufacturers to describe the complete user interface for all device requirements, virtually eliminating the need for device specific software applications to set-up or diagnose radar level gauges, valve controllers and other complex sophisticated devices.

"End users are not satisfied with using separate and standalone device-specific software applications or add-ons to meet host system integration requirements. This limits their freedom of device choices and adds significant lifecycle costs to integrate, train and maintain



New EDDL capabilities provide improved Windows-style data visualisation and display capabilities.

Graphing and charting functions support setup of complex devices such as this Echo Curve from a Radar Level Device.

standalone software applications," says David Eisner, Honeywell Vice President of Technology and member of the HCF Board of Directors. "EDDL technology helps eliminate these standalone applications and provides an integrated solution, which improves ease-of-use and reduces total cost of ownership."

The enhanced EDDL further standardises the user interface for managing intelligent devices and simplifies the system integration problem for device manufacturers. The enhanced capabilities eliminate the need for Windows resource files, supplemental files, and other DD modifications previously required by some asset management applications.

Platform Independent

"EDDL, being text-based, is independent of operating systems and control platforms. Operating system and platform independency, along with backward compatibility are some of the biggest advantages of the technology," says Hans Georg Kumpfmüller, Siemens. "Another is that field device additions can easily be incorporated without affecting the runtime stability of the control system. EDDL files are interpreted by the host system and are not executable software."

Trending functions assist with monitoring key device performance parameters over time such as this Signal Strength trend.

If a system must integrate many disparate software applications, then it is vulnerable to problems caused by operating system upgrades, control system revisions, and new versions of the device software. This problem can be further compounded by software from multiple suppliers different than that of the host system. With the system and platform independency of EDDL, many of those problems can be eliminated.

Safety, reliability and optimisation all depend on a field instrument or valve being set up correctly and properly maintained. EDDL provides a capability called "Methods" that helps to ensure device set-up and maintenance procedures are performed accurately and consistently. A Method is essentially an automated procedure that is developed by the device manufacturer and implemented in the device DD file to ensure set-up, maintenance and diagnostic functions are performed properly.

HART To HART

"Most plant managers know they will benefit from additional diagnostics available with smart instrumentation. However, some often just specify the need for HART Protocol support, which may not necessarily deliver the wide range of benefits available from the information resident in HART devices," says David Eisner, Honeywell. "Additional diagnostic value is delivered by the DD/EDDL files, which provide all this device data and diagnostics.

"Therefore, it is important for plant managers to specify to their suppliers the requirement for DD files that describe all the device functionality and are qualified with HART development tools."

HART Communication technology combined with EDDL benefits the user who does not want to be restricted to a single vendor's solution. Virtually all control system and instrumentation vendors support HART and EDDL, so it is easy to specify the best sensors, analysers, drives, actuators, valves, etc. The end user does not have to worry if specific software packages are available to support various devices; with EDDL, all devices can be supported by all control systems.

EDDL provides all the information operations and maintenance personnel need in an understandable and useful format. The EDDL enhancements are backward compatible, ensuring that existing DDs will continue to work and allow users to have a continuous forward migration path with no investment loss. EDDL provides a well-defined structure for supporting the most simple to the very complex field device. This structure allows the same DD to have a common look and feel across applications, which reduces the learning curve and supports multiple host applications. It also pays huge benefits in longevity and stability over the plant lifecycle. DD files written in 1993 and registered in the HCF DD Library – and unchanged in 13 years – still work today on all compliant host applications.

The HCF goal in enhancing Device Description Language has been to simplify the process of integrating smart devices with control systems for both users and manufacturers.

Biography

Ron Helson is Executive Director of the HART Communication Foundation (HCF), an international, not-for-profit organisation that manages the HART Protocol standards and provides worldwide support for application of the technology. Ron has 30 years experience in the process instrumentation and control industry including more than 20 years in the engineering and management of process automation systems. He has a Bachelor of Science and Masters degree in Electrical Engineering and is a registered professional engineer and senior member of ISA. Ron has led the HCF since it was formed in 1993.

EDDL: More Than Just Diagnostics

EDDL makes it easy to integrate all the field instruments in your plant. By *Martin Zielinski*, HART – Fieldbus Technology Director at Emerson Process Management.

Electronic Device Description Language (EDDL) is a universal interface to diagnostic, real-time and asset management information contained in more than 15 million field instruments from a host of manufacturers. With EDDL, a user can calibrate instruments, diagnose problems, provide data for UI displays, identify process alarms, and obtain information needed for high-level software, such as MES, UI/SCADA, plant historians, asset management and ERP.

All of this EDDL data is readily available through HART, Foundation fieldbus and OPC interfaces, and an end user doesn't have to buy anything or write any software to get it. EDDL is supported by virtually every vendor of process control systems worldwide, and the information it describes is available in any HART Communication or Foundation fieldbus based instrument made since 1990. This article takes a look at some of the functions available to the user through EDDL.

Handhelds To Asset Management

The electronic device description language (EDDL) first appeared in 1990, when HART instruments hit the market. A technician with a universal handheld communicator was able to walk up to any HART instrument, plug in, calibrate and adjust the instrument in the field. All he or she needed was the correct EDD file, which was available from the instrument vendors. Interoperability was born!

EDDL is a text-based description of what variables are contained in the instrument, such as flow, pressures, ambient temperature, high and low limits, calibration settings, and so on. The description defines each variable, and tells how to access it. Some HART instruments contain up to 100 variables, all of which are described in the EDDL syntax, and all are available to any system that can plug into the instrument via a HART or Foundation fieldbus interface.

In 1992, the HART Communications Foundation (HCF) noted that many users wanted to obtain the data via a digital interface, so it standardised EDDL to describe the information in a programmable manner for a host control system. In 1994, the Fieldbus Foundation (FF) adopted EDDL as a standard. Profibus adopted EDDL as well, but the three organisations each supported the technology independently and slightly differently. In 2003, the three groups – HCF, FF and Profibus Nutzerorganisation eV (PNO) – collaborated and submitted a unified version of EDDL to the IEC, where it became an international standard in 2004: IEC 1804-2. This laid the basis for the creation of a single engineering environment in a host that can support any field device, from any manufacturer, using any communication protocol. Interoperability was strengthened.

Work among the three groups – FF, HCF and PNO– began almost immediately to enhance EDDL and extend the concept of interoperability to the user interface and device diagnostics. In the enhancements that followed, EDDL went far beyond equipment calibration. Today, enhanced EDDL supports device diagnostics, asset management, user interface (UI) displays, bar charts, trends, device signatures and historian functions.

In 2005, the OPC Foundation announced its adoption of EDDL as the descriptive technology used in its Unified Architecture (UA). The OPC effort will allow OPC UA-based software to access fieldbus instruments – plus devices running on Ethernet, other networks, and under operating systems other than Windows – by using EDDL descriptions to gain access to instrument data. Interoperability is extended.

None of these enhancements and usage affects the description files, so data from more than 15 million EDDL-compatible instruments installed in the field – plus all the new field instruments – can now be accessed easily. EDDL is transparently backward compatible to 1990. And, since virtually every control system on the market today has access to asset management software, it means that all that EDDL data is readily available for any purpose, from instrument calibration to ERP.

For example, at the 2005 ISA Show, the Fieldbus Foundation exhibited a multi-vendor demonstration with all these capabilities. Emerson Process Management, Endress + Hauser, Siemens and Smar demonstrated pressure transmitters, temperature transmitters and a machinery health

transmitter, performing diagnosis, calibration, and configuration of complex devices, with all devices providing information to an asset management system.

Eliminating Extra Software

One problem that has always plagued end users is the never-ending plethora of different software packages needed to keep a modern process control system running. EDDL eliminates many of those packages. For example, the HART-based Rosemount 5400 radar level gauge once required an additional software application to view the tank spectrum, a function needed for advanced configuration. Today, the 5400 has incorporated all the necessary data in EDDL, so the extra software is not needed.

Another example is the Foundation fieldbus-based CSI9210 Machinery Health transmitter from Emerson. It is a complex device capable of diagnosing conditions such as motor-pump bearing failure, pump cavitations and coupling misalignment without the need of special software. Everything is in the Electronic Device Description (EDD) file, ready to be displayed on any host utilising an interpreter readily available from the Fieldbus Foundation.

If a system has to rely on specialty software, then it is vulnerable to problems caused by operating system upgrades, new operating systems, control system revisions, and new versions of the device software. This problem can be further complicated if the specialty software is provided by a supplier different than that of the host system. With EDDL, many of those problems can be eliminated because EDDL, being text-based, is independent of operating systems and control platforms. The host system may change, but the description of the field device remains the same. The EDD changes only when the device changes.

Therefore, one way to keep a control system as immune as possible from problems with software revisions and operating system upgrades is to rely on EDDL

for the majority of configuration, diagnostic, UI and asset management data requirements, and use specialty software only where needed.

Driving UIs

In some cases, UI software obtains its data from historians, SCADA software, or a real-time database. If end users create and configure the displays, they have to figure out what the variables are, where they are in the I/O structure, what they mean, and what they should look like on a screen. This is a particular problem when it comes to configuring equipment screens for monitoring or diagnostics for specific devices.

With EDDL, equipment vendors write the EDDL specification to identify the variables, the order in which they should appear, conditions under which certain items should be displayed, and so on. In fact, a user doesn't even have to configure a display at all: EDDL will produce a display for a device, Figure 1.

Figure 1 illustrates the UI screen for a Radar Level Gauge. The data is read directly from the EDD file without any modifications or organisation. It represents how the transmitter manufacturer thinks the data should be organised. Figure 2 shows the same data, same EDD file, but on a different host. It is the same information, with a different 'look and feel.'

In other words, the device determines what will be displayed, while the host control system determines how it will look. This ensures that all displays on a given process control system have the same 'look and feel,' regardless of the device supplier. On Host #1, the buttons 'Close', 'Messages' and 'Help' are unique to it. Whereas on Host #2, the buttons 'OK', 'Cancel', 'Apply' and 'Help' along with the navigation on the left, are unique to it. The information in the label 'Process Variables' is identical on both hosts. It is described in the EDD file. It looks a little different on each host, but the content is the same.

EDDL also describes conditional images, and under what conditions they should appear. For example, if a machinery health transmitter is monitoring a motor, drive coupling and pump, and the pump starts to cavitate, the pump image can be highlighted (Figure 3), indicating a problem.

This requires no intervention or decision-making from the control system, because the capability is built into EDDL technology. Likewise, Rosemount has a differential pressure transmitter (HART and FF based) that can detect plugged impulse lines. EDDL can be used to display this diagnostic in an interoperable manner as shown in Figure 4.

When the OPC UA software packages are able to obtain EDDL data, it will open up a whole new world of diagnostics, loop tuning, and process optimisation. For example, EDDL-based diagnostics can identify certain equipment problems, such as plugged impulse lines, but they cannot diagnose process problems. Such diagnoses often require advanced software, which will be available through the OPC UA interface. Previously, making such advanced software work often required extensive configuration efforts to link the diagnostic software

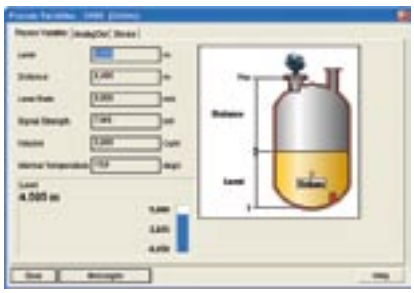


Figure 1: Radar Level Gauge on Host #1

Figure 2: Radar Level Gauge on Host #2

How EDDL Works

First, an instrument or device designer uses EDDL syntax – an XML-like language – to describe a device and all its parameters in detail. This can include parameters such as process variable, setpoint, high-low limits, ambient temperature, etc. EDDL even supports Methods, a scripting language that supports step-by-step, interactive calibration procedures. Device designers have been doing this since 1990 with EDDL, so it is nothing new to them.

With the new enhancements, the designer can also define where all the important parameters should appear on an UI display, such as in columns or bar charts, and in which order, Figure 1. Designing an EDDL UI display is much like defining a web page. The designer can also define the conditions under which certain graphics are to be displayed, and what the UI should do about it; for example, if a pump bearing temperature exceeds a certain point, the pump icon should be high-lighted, Figure 3.

Back To Binary

The AT-400 Device Description Tokenizer Toolkit v 5.0 from Fieldbus Foundation checks for syntax or logical errors in EDDL source files, converts source files into a compressed binary file format, and issues error messages that help trace and correct the syntax. Once the EDDL file is tested and registered by the Fieldbus Foundation, it is available at the Foundation website in its compressed binary format, the Electronic Device Description (EDD) file. It is also available

Figure 3: Cavitation in the pump is highlighted.

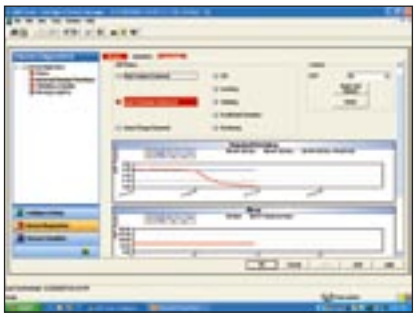


Figure 4: Plugged line diagnostic preventing an abnormal situation.

to device parameters; with EDDL, configuration will be minimal. It will be possible for end users and systems integrators to make use of the extensive array of support software that is OPC UA compliant.

Asset Management Data

EDDL can also automatically provide data suitable for asset management and maintenance purposes. For example, EDDL can specify that certain data from the instrument – such as a valve signature – should be maintained as 'persistent data' for diagnostic purposes. This keeps the data available for comparison to the current valve signature for problem analysis. The data is stored in a location on the host and is retrievable by an asset management package.

Similarly, graphs and charts can be defined and the data to generate them can be stored in the host. This allows instrument data to be plotted, displayed in a chart, or compared to other instrumentation. This data is in addition to what the control system usually keeps and displays, and is especially helpful to asset management software packages used by maintenance.

Applications that can be supported include visualising complex data, radar gage level configuration, valve curves, analysers and motor controls – all without writing custom code.

Interoperability

EDDL is the only standard in the automation industry that not only supports every function from calibration to asset management, it provides a universal interface to 15 million existing field instruments. This interoperability simplifies the control system integration process, because all a systems integrator or end user has to specify in the bid process is that all instrumentation and control equipment conform to the International Standard, EDDL. This eliminates interfacing problems.

Interoperability also benefits the user who wants specific equipment. Virtually all control system and instrumentation vendors support EDDL, so it is easy to specify best-of-breed sensors, analysers, actuators, valves, and so on. Competitive bids are easier to evaluate, because the end user does not have to worry if specific software packages are available to support various devices; with EDDL, all comparable EDDL devices can be supported by all control systems. Interoperability also means that it is easier for an end user to obtain equivalent replacements for sensors and actuators, in case a device is not available for one reason or another.

Finally, interoperability means that operators and maintenance personnel can easily find the calibration and diagnostic information needed for a particular device, and all EDDL-compatible devices will provide the necessary information in a 'look and feel' of the host system. With devices becoming more complex every day, having EDDL makes it easier to operate, diagnose and maintain them.

In short, EDDL provides all the information operations and maintenance personnel need in an understandable and useful format.

through the device vendor via a download or a CD-ROM. The binary format is more secure, in that, it is difficult to change.

Look & Feel

The control system vendor acquires the AT-401 Device Description Services Toolkit v 5.0 from Fieldbus Foundation, and integrates this tool into the control system. This provides the control system with the capability to read the EDD files and implement what is described. For a given project, the control system supplier obtains the EDD for every instrument and field device in the plant, no matter the vendor. Once the EDD files have been loaded and linked into the control system, the field devices can be set up with the UI displays as described by the field device designer, but with the look and feel of the host.

The two toolkits described above are available from Fieldbus Foundation. A similar tool is available from the HCF. For example, HART Communications Foundation (www.hartcomm.org) provides the SDC-625 Smart Device Configurator. The SDC-625 supports all EDDL constructs, evaluates an EDDL file, and allows configuration of a field device. The SDC-625 can talk to a device via an RS232 to HART interface (eg: a HART modem) or to a field device being simulated using Xmtr-DD software. The SDC-625 also includes a very helpful communication log window that shows the commands sent to a field device and its responses in real-time.