Worth its weight

Registration assures performance of HART, Foundation Fieldbus and FDI technologies
Distributed diagnostics

Enhance operational plant uptime with accurate data from your FOUNDATION Fieldbus™ junction box.

Maintain a constant watch on your installation with the Fieldbus Diagnostics Module (FDM) from Phoenix Contact. Our FB-DIAG/FF/LI product is no larger than a deck of cards. It supports NAMUR NE 107 and offers all standard physical-layer diagnostics. No software license is required and a three-wire connection makes installation easy.

Download our white paper at: www.phoenixcontact.com/processfieldbus
Rising value

OUR ROLE AT FieldComm Group has expanded since combining the Fieldbus Foundation and HART Communication Foundation. With the addition of FDI technology, our strategic importance in “simplifying the complexity” of process automation systems grows. As the integration technology of choice for many protocols, it is enabling users and suppliers to focus less on the underlying protocol and more on the data.

This is not to say protocols are less relevant, in fact quite the contrary. In talking to users, I hear one common theme, that regardless of IIoT initiatives, future architectures or newly available protocols, no one is “ripping out” field devices. These field devices are delivering data through robust protocols trusted by users to meet their performance, interoperability and security needs. In fact, it becomes increasingly clear that the IIoT will require many protocols.

So what does the future plant and enterprise look like at the field device level in the next 10 years? I think it is fair to say we will see a combination of HART, Foundation Fieldbus, HART-IP, WirelessHART and many others. Physical layers will include 4-20 mA, Ethernet, wireless and maybe more. The key to IIoT now becomes how we integrate these various protocols and what we do with the data they provide.

To develop standards, we use a collaborative working model that leverages hundreds of volunteer subject matter experts from more than 340 member companies. We also partner with organizations like the OPC Foundation to create “information models” that help extend field device information from the OT world to IT side where many users are less familiar with the origin and meaning of process data. FDI is one such standard that helps “simplify the complexity.” Use cases such as asset management, analytics, monitoring and diagnostic support across enterprises all require a common model to compare like information, regardless of protocol. The protocol is how it gets there, however, the use cases only care about the information!

Our cover article focuses on product registration and conformance services. As devices, hosts, and architectures become more complex, assured adherence to standards at the protocol and information model level is a requirement for maximizing captured value. In the past year, our verification team has completed new or updated registrations for nearly 200 products. Trust me, registration is worth its weight in gold!

By continuing to build on the “gold standard” of our protocols, bridging them to the IoT and ensuring they conform to these standards, the industry can seize this data revolution to achieve improved performance in their operations and enterprises. FieldComm Group will be there to help each unique user capture the value of this revolution by meeting them where they are today and getting them there with many solutions from our technologies and from our members.

Ted Masters
President and CEO
FieldComm Group
Registration assures value
The path to a registered checkmark is rigorous, but smooth

**FOUNDATION Fieldbus** and HART provide valuable information and powerful communications, but these capabilities can be incomplete and integration may be difficult if the software and hardware are not designed and engineered to conform with the specifications. The FieldComm Group helps users avoid problems by offering assistance to suppliers in the form of consultation and testing services. Products that pass the tests conform to the specifications, are registered and may display the “Registered” logo associated with its implemented technology, which assures the specified functionality and interoperability.

“Testing and registration is very important,” says Sean Vincent, director, technical services, FieldComm Group. “It provides third-party verification of conformance to standards, which results in better products that perform reliably and predictably for the end user.”

This recognition is important both to suppliers and users. “Third-party registration provides peace of mind to the specifying engineer—the manufacturer says it’s good, and the FieldComm Group says it meets the certification requirements,” says Eric Wible, director of engineering, Fluid Components International (FCI).

“For suppliers, the customers will not spec you if you don’t have it,” Wible says. “For the user, if there is any issue in bringing the instrument up on startup, you’ll get the full attention of the FieldComm Group as well as the manufacturer.”

Device manufacturers agree that registration benefits everyone. “Users benefit from such tests because they know that field devices provided by Endress+Hauser will properly work in their system environment,” says Lukas Klausmann, senior marketing manager, Industrial Communication, Endress+Hauser. “Furthermore, risks in plant operation, as well as during commissioning and startup, will be reduced.”

As a field device and solutions provider, Endress+Hauser benefits from testing because it ensures proper integration of field devices and solutions in different system environments and industries. “Based on FieldComm Group compatibility, Endress+Hauser makes further tests with the field device in our own test lab with all major systems to ensure that additional device-specific benefits are available for the users in their environment,” Klausmann adds.

In short, says Scott Saunders, president and CEO, Moore Industries, “It’s another layer we have to go through, but if I put myself in the customers’ shoes, and I always do, I want to know that device in service will work with another vendor’s device.” The net result is a user that can choose the best-in-class product for his/her application.

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Test cases are written in software, and automated testing tools exercise the permutations. Here, a Foundation Fieldbus device is undergoing a physical layer review.
When it comes to HART data, the SSX/SST Functional Safety Isolators and Splitters are game changers by passing on valuable HART data from your safety loops to your basic process control system or monitoring system.

Unlike other isolators, the SSX and SST allow critical HART diagnostic, process and calibration information to pass through from field transmitters to HART enabled host systems and vice-versa. They also serve as “blockers” to protect and isolate your Safety Instrumented System from inadvertent disconnections or failures in your auxiliary control or monitoring system.

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TESTING IS A PROCESS, NOT AN EVENT
Before a hardware or software product is registered, it is tested to ensure that it not only communicates the specified parameters as expected, but that it does so in many different possible scenarios and under adverse conditions often found in industrial networking applications.

There are required capabilities, such as read/write, and optional capabilities for various devices. “The specifications tell you many things about possibilities, and the tests verify single or multiple implementations of those possibilities,” says Vincent.

Test cases are written in software, and automated testing tools exercise the permutations. “Along with the positive cases, where we make sure it works, we test many more negative cases using erroneous information, and simulate mistakes and network malfunctions to make sure the device tolerates and recovers from error conditions, and keeps working,” Vincent says. “This makes sure the devices are robust.”

The registration process starts long before the test date. “Most projects start with the specifications. The vendor’s development team gets training and serves as the primary developers, but others may help,” Vincent says. “Questions are answered by FieldComm Group and the vendors’ trained experts.”

As they develop the product, vendors can use quality assurance (QA) test tools to be sure the performance is there early in the process so they can raise issues and resolve questions. “Being engaged with the tools and tests along the way really shows at the end test,” Vincent says. “Development may take months or years, so we view it as a long-term partnership. There are many options, and we expect questions along the way.

“We try to make everything clear so people pass the first time. Discrepancies are caught early during the test process.”

Unidentified condensate in steam systems can result in a range of issues from process inefficiencies to equipment failure and safety issues. If only I had more visibility into the health of my steam traps.

YOU CAN DO THAT
Accurately detect potential safety issues and process inefficiencies with real-time automated steam trap monitoring. Knowing the status of your steam traps could enable you to prevent serious safety incidents and minimize production losses. With the Rosemount 708 Wireless Acoustic Transmitter, you’ll have instant visibility to all your critical steam traps through a non-intrusive, WirelessHART® monitoring system.

Backed by Emerson’s proven experience in Smart Wireless field instrumentation, the Rosemount 708 will enable you to prevent serious safety incidents and minimize production losses without running all over the plant. Talk to Emerson. We’re the experts in wireless so you don’t have to be.
The test backlog, or queue, has been eliminated. “All tests are done on a schedule now. We schedule them based on clients’ start dates and plans,” Vincent says. “We schedule up to a year in advance, but there are generally openings within a week or two.”

The registration process and test labs are not adversarial. “They help and support both users and registrants, and I must mention, you don’t have to be a member to register a product,” Vincent says. “It’s a partnership of vendors, the FieldComm Group and users. We help by performing audits and providing education. When a test fails, it’s usually due to an oversight or misunderstanding. It’s a chance for us to work together to resolve it.”

**COOPERATION ASSURES SUCCESS**

“The process of certification testing is important because suppliers can verify whether the device meets...
the specification and ensure the device is stable and reliable,” says Huixuan Yu, senior engineer, Microcyber, which produces registered products for WirelessHART. “During the process of testing, suppliers can get a better understanding of the technology for research and development of related products in the future.”

For example, Microcyber purchased the relevant test equipment from the FieldComm Group and tested its device before the official certification test. During testing, “We and the FieldComm group exchanged feedback to validate the latest, upgraded test system,” Yu says. “After the test was completed in our facility, we submitted the device to the FieldComm Group for official testing, and received authorized certification.”

The process instrument manufacturer must fully understand the test protocol, the specification, and how it applies to their instrument. “They may fail several times and have to go back and tweak it, but they can apply those learnings to the next model,” says FCI’s Wible. “Understand the test protocol, and things will go smoothly. There’s always some frustration, but you need to really know it to get certified, and the users understand that.”

Moore Industries concurs. “FieldComm Group supplies the toolkit, we can do all the communications testing here, work out any kinks and bugs, then send it to the lab,” says Saunders. “It saves us on service and support—we don’t want to sell an $800 instrument, then spend $5,000 getting it up and running.”

Once registered, Yu says, “Devices approved by the FieldComm Group are quality-assured, and suppliers can use the ‘Registered’ mark in literature, documentation and marketing materials. Users prefer to choose registered devices.”

CERTIFIED TRAINING

Companies seeking customized training frequently turn to Lee College Center for Workforce and Community Development (www.lee.edu/workforce). The center is home to several FOUNDATION Fieldbus-certified training programs that teach students how to build and configure fieldbus segments and devices. The Fieldbus Center is one of only eight certified training sites in the world, boasting a multimillion-dollar pilot plant and several modern micro-plants outfitted with all the technology found in today’s modern industrial environments.

Registered products offer more than predictable performance—they also can be expected to have a common set of features. This makes it easier to learn how to use them, and that knowledge transfers to unfamiliar devices and brands. “Registration means you can be confident it will operate the way you want it to,” says Chuck Carter, retired director and now instructor, Lee College. “It also means that once you learn to work with these systems, you can take it to the bank. They work the same way around the world, and across brands.”

Certified training shows you all the capabilities the instruments have in common. “Vendor-based, uncertified courses may only show you the vendors’ features,” Carter says. “As an instructor, if a pressure transmitter is registered, I know it will work a certain way and I can teach it using a consistent operability and approach, with best practices.

“At the same time, over the years we have come across certain concepts and pieces of equipment that are great answers. If it were not in a particular vendor’s offerings, they wouldn’t tell you about it. I want the users to have the best information, so I tell about it whether the system I’m teaching on has it or not, so users can make good business decisions.”
IT SEEMS THAT everyone is talking about the fourth industrial revolution—Industrie 4.0, the Industrial Internet of Things (IIoT) and connecting the plant floor to the cloud. As a result, we’re seeing a fog of alternative technologies and standards competing for the attention of engineers, manufacturers and vendors, and rightfully so, as the ability to gather and analyze information is key to driving increased value in process manufacturing.

But regardless of where the data ends up, much of it must come from the plant floor and at the interface between the process and the IT networks. There, says Scott Saunders, president and CEO, Moore Industries, “Our job is to provide customers with data and the capability of smart instruments to support predictive modeling, asset management and reduced calibration.” This is where you find Foundation Fieldbus, HART and FDI technologies.

SHARED DATA, LEVERAGED RESOURCES

For remote applications, “It’s very easy to add cloud connectivity for visibility into device health, to be sure everything is working,” says David Lincoln, digital leader, measurement and analytics business unit, ABB. “In the control system environment, a local cloud is useful for data gathering, analysis and local trending.
For example, tracking how many times a valve opens and closes is a low-cost addition. Then you can share valve operating data with one valve expert across the organization, or with a vendor service technician sitting miles away, through the cloud. 

“We make the data available, and the customer decides how to use it,” Saunders says. “Most use an intranet for IIoT, not an immediate jump to the cloud over the Internet, due to security concerns. That’s their responsibility, they can decide that technology. Our next two or three products will have Ethernet running Modbus TCP, Ethernet IP or HART-IP. We make IP available to them, they decide how high they want to go. OPC UA? XML? It’s up to them.”

For field instruments outside a control system, “The cloud provides the connection and a technician can analyze the entire fleet,” says Neil Shah, product manager, control systems technologies, ABB.

Within a control system, with no additional connectivity or infrastructure, “Data may be locked into the system. We need to convert it to get it out to the experts for analysis,” Shah says. “For that, we can use device management tools.” FieldComm Group’s FDI technology is made for the job (p. S-13). Shah says, “FDI is open, and enables us to draw on data not just from ABB devices, not just from ones that are not already connected, and not just from a single source.” Capabilities found traditionally in FOUNDATION Fieldbus and HART portable communicators are now connecting to the cloud to save device configurations, share configuration data, perform automatic backups, and make the latest data and configurations equally as available remotely as they are locally. Saving trend data to the cloud allows users to troubleshoot device issues with colleagues anywhere in the world, and gives global access to process performance data.

“Our DevCom2000 Smart Device Communicator and our DevCom Apps all support HART-IP. This allows access to all HART devices in the network through an Ethernet connection to the WirelessHART gateway. The user can download HART device configurations and make parameter changes,” says Jeff Dobos, president, ProComSol. “Now we’re adding functionality for online use. You can view the entire network hierarchy on one screen showing measurement values, device status, and record and store the data locally or in the cloud.”

“Our software also can save trend data—for any period you want—to the cloud to share with colleagues all over the world,” Dobos says. “You can do it from the office or home, you don’t need to go into the plant.”

**OPC UA DELIVERS DATA EVERYWHERE**

For a significant group of suppliers, the default solution for connecting disparate devices, packages and systems is OPC UA. “The big thing right now is OPC. It’s a big, open platform for Ethernet and the Internet,” says Saunders.

As part of a continuing partnership between the OPC Foundation and FieldComm Group, the OPC UA information model is a part of the framework upon which FDI is built. “This allows complex information rendered in device package to be seamlessly communicated to disparate applications and devices,” says Tom Burke, president and executive director, OPC Foundation. It allows a generic application to connect to the corresponding device or host application and consume data without any knowledge of the underlying protocol of the device. Much like plug and play in the consumer electronics business.

“End users consistently tell us that they have no interest in replacing their field devices,” says Ted Masters, CEO of FieldComm group. This is hardly surprising given the large installed based (40 million or more
units) and long lifecycle of field instrumentation. Technologies like FDI and OPC UA allow for creation of “digital twins” for the field instrumentation that can then be mapped into a variety of application formats. Masters continues, “When we give management presentations, our computers probably have three or four different ways of connecting to a projector. Most users don’t care if VGA, HDMI, DVI, or wireless connections are used, as long as the image on the computer is rendering properly by the projector. It’s the same in process automation. Many, slightly different, protocols will continue to operate in plants worldwide, but the information delivered by those protocols must be standardized for consumption by all process applications. This is the ultimate goal of the FDI and OPC UA information models.”

CLOUD CONNECTS VIA OPC

On the cloud side, evidence that OPC UA is the key to field-to-cloud connectivity comes from Microsoft. “We’ve been investing quite heavily in a platform for Industrie 4.0, Made in China 2020 and the IIoT,” says Erich Barnstedt, software engineering lead, Microsoft. “My team owns the industrial vertical for Azure IoT, and OPC UA is the only open industrial protocol we support to bring data to the cloud and all its services. All the back-end services understand OPC UA. And OPC UA is open-source, which is a big change. Supporting open-source is a winning strategy.

“Everything is gravitating to OPC UA, and we want everyone to support it.”

Instead of having many protocols to provide and support, it’s just one OPC UA interface. “It takes less than a week to become compatible with a huge number of devices,” Barnstedt says. “FieldComm Group offers an entire ecosystem of devices compatible with FDI technology. It’s protocol independent and allows my group to simply support OPC UA.

“At the NAMUR conference [in November], they’ll have a joint demo using OPC UA to connect FieldComm Group technologies to Microsoft Azure, showing how you can quickly get insights into machine data from the cloud with a few clicks.”

ONE TOOL FOR ALL

– How many tools do you need?
– One, just only FieldMate!

FieldMate is a next generation tool to realize the Device configuration, adjustment, and functionality test. FieldMate works with all registered HART & FOUNDATION™ Fieldbus devices and uses both EDD and DTM technology.

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Users Weigh In

This year’s annual protocol survey was completed by 133 members of Control’s primarily North American subscriber list representing the process industries including Food, Chemicals, Pharmaceuticals, Primary metals, Petroleum, Utilities, etc.

**Percent of installed wired devices by protocol**

<table>
<thead>
<tr>
<th>Protocol Type</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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<tbody>
<tr>
<td>HART</td>
<td></td>
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<tr>
<td>FOUNDATION</td>
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<tr>
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**How connected are your digital protocols?**

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<th>FOUNDATION 2016</th>
<th>FOUNDATION 2017</th>
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<tr>
<td>Permanently for real-time process systems</td>
<td>36%</td>
<td>44%</td>
<td>50%</td>
<td>66%</td>
</tr>
<tr>
<td>Occasional via handheld</td>
<td>59%</td>
<td>61%</td>
<td>39%</td>
<td>37%</td>
</tr>
<tr>
<td>Occasional via PC</td>
<td>41%</td>
<td>34%</td>
<td>33%</td>
<td>23%</td>
</tr>
<tr>
<td>Permanently for off-line activity</td>
<td>23%</td>
<td>17%</td>
<td>15%</td>
<td>14%</td>
</tr>
<tr>
<td>Permanently for real-time enterprise systems</td>
<td>10%</td>
<td>12%</td>
<td>15%</td>
<td>9%</td>
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**Major challenges to device integration**

- Training and education
- Legacy platforms limit protocol integration
- Dealing with device drivers and revisions
- Cost and installation of interface devices
- Need proficiency in multiple protocols
- Access/availability of tools/privileges
- User interface hard or risky to use
- Available network options do not meet needs
- Other

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FDI scales new heights
Field Device Integration specification expands for greater capabilities

THE FIELD DEVICE Integration (FDI) specification and ecosystem isn't resting on its laurels. “FDI packages and hosts help bring field device information to control and upper-management systems, so their key is providing better interoperability, saving time and reducing headaches for users,” says Achim Laubenstein, integration technology director at the FieldComm Group. “However, as FDI packages and hosts from ABB, Emerson, Siemens and others begin to arrive, suppliers want to use the FDI information model and OPC UA to connect to other communication protocols, get data to the enterprise level via Microsoft Azure, and participate in the Industrial Internet of Things (IIoT) and Industrie 4.0.”

FDI was conceived to bring previously hard-to-reach data into uniformly reported and displayed formats, to help improve decisions and increase profits for process automation companies. It merges the advantages of an FDT Device Type Manager (DTM) and Electronic Device Description (EDD) in one, scalable software device package to help manage the complete lifecycles of basic and sophisticated components, including commissioning, configuration, diagnostics, calibration, maintenance and other functions.

“The clear benefit of FDI is its simplified drivers for different host systems,” says Michael Bückel, product manager at Endress+Hauser’s Flowtec division. “Where we used to have many drivers for many different host systems in place, FDI shrinks it to just one package that’s needed to get a device up and running or for operations and maintenance.”

In addition to simplifying the device management process, FDI will also enable:
• Open access to cloud-based computing services via jointly developed OPC UA information models,
• Offline configuration,
• A device package repository,
• Security, and,
• Communication servers for automation protocols.

These initiatives will enable FDI (published as the IEC 62769 standard) to fulfill its mission statement: ONE device – ONE package – ALL tools.
“The FDI standardization team did an excellent job of writing the FDI specification—fully supported by the FDI Package IDE [Integrated Development Environment]—and it’s a huge difference from the past,” says Neil Shah, global product manager for fieldbus and asset optimization in ABB’s Industrial Automation division. “Where users previously had to tweak device drivers on each system and modify EDDs to comply with each supplier’s host, FDI makes EDDs independent of individual supplier protocols, and allows all instruments to work with any host.”

Shah reports there are presently three host systems that support FDI, including:
- Field Information Manager (FIM) from ABB;
- Instrument Inspector from Emerson Automation Solutions, and
- Process Device Manager (PDM) from Siemens

“They all have the same purpose of integrating field devices into systems, and also allow configuration, commissioning, diagnosis and parameterization,” explained Shah.

Despite its potential advantages, some suppliers are concerned that FDI means they’ll have to develop software for it in addition to the EDDs and DTMs they already write for their field devices, which continue to be deployed in systems worldwide.

“FDI packages and hosts are at the beginning of their implementation cycle. They will eventually replace EDD and DTM,” adds Laubenstein. “We’ve already held several plugfests where different suppliers can compare and work hands-on with FDI packages and hosts, and we’re going to have more. We did confirm at the plugfests that FDI can achieve much better interoperability, and so our advice is to try FDI with OPC UA server because it’s ready for IIoT and Industrie 4.0.”

OFFLINE CONFIGURATION

One of the most sought-after capabilities in process control has been uncoupling configuration and other tasks from the components themselves, which allows this programming to be done remotely and completed before equipment is installed on plant floors.

“Offline configuration and user interface plug-ins (UIP) are so important because they let us create standardized configuration files, and download them to many devices, mostly when commissioning new plants,” says Dan Ryan, engineering program manager for Plantweb at Emerson and chair of the FieldComm Group Integration Working Group. “FDI lets us take device packages and work up configurations without the spreadsheets and manual processes we used to use. That’s a big savings in labor and time.”

Ryan explains that UIPs are equally useful because they enable enhanced interfaces for troubleshooting. UIPs are an optional part of an FDI device package. For OPC UA is the key to the IIoT

An FDI Host implementing the Information Model Facet exposes a standardized OPC UA Information Model containing the complete device data, accessible via FDI Clients and standard OPC UA Clients/Servers. As part of the OPC UA infrastructure, the data can be used by Asset Management Systems or published into IIoT platforms and processors.
example, Emerson’s Rosemount Radar Master Plus UIP provides annotated, interactive graphics, added graphical tools, and improved interoperability. “The UIP in FDI allows Radar Master Plus to be used on any FDI host,” says Ryan. “There’s more work to get FDI phased in now and it is a longer-term investment, but everything’s going to be better with it.”

Mani Janardhanan, program management director for Plantweb and IoT at Emerson, reports that FDI is beginning to enhance the capabilities of its products, including development plans for AMS Device Manager and the AMS Trex device communicator. “Our customers want a unified technology to communicate securely with their field devices from any platform, and FDI is that solution,” says Janardhanan. “Emerson is already well down the path on FDI, we introduced our Instrument Inspector in 2016, and it’s downloadable from our website. These solutions will make the offline configuration of plants and deployment better, which can help users and EPCs save man-years on commissioning.”

INTEGRATING DISPARATE NETWORKS

Today’s plants may contain a mixture of device technologies, some based on proprietary and open standards. FDI can access these devices using FDI Communication Servers. The Communication Servers integrate to the FDI Server using Communication Server Packages, allowing FDI to integrate these different networks within a single information model. This enables users to leverage their installed base of devices when migrating to the new FDI technology. FDI Communication Servers even support nested communication, where a remote device may be tunneled through a different protocol, supporting complete access to the embedded device data. Just like devices, communication servers are fully exposed in the FDI Server Information model. FDI Servers communicate with FDI Communication servers using OPC UA.

Cloud connectivity is enabled with the implementation of OPC UA on the FDI Server that exposes the FDI Information Model. The FDI Information model provides a consistent presenta-
tion of the device (the “digital twin”) for enterprise applications, cloud based services, etc. The Information Model of each device is defined in the device’s “FDI Device Package” using EDDL technology.

Smitha Rao, co-founder of Utthunga Technologies, adds that, “FDI enables the secure and remote communication to the field devices using FDI Communication Server, which is built based on industry-proven OPC UA technology.”

**DEVICE PACKAGE REPOSITORY**

Because technicians configuring instruments don’t want to download software to each one individually, FieldComm Group is building a cloud-focused repository of all certified, FDI packages and secure EDD packages. This allows FDI-enabled devices to connect automatically, and check if they have any updates.

“The plan is to have an online system provide FDI device packages on request, which will give users quicker access to the latest versions,” says Endress+Hauser’s Bückel. “Again, that one device package can be installed in a user’s registered host system no matter what supplier it comes from, which makes that system simpler to maintain, and reduces lifecycle costs.”

Stephen Mitschke, director, Foundation Fieldbus Technology, FieldComm Group, adds that the FDI Device Package and Repository initiative is similar to the way Microsoft Windows downloads updates without requiring its users to go and get any software. Though still being built and tested, the repository will be built on Microsoft Azure.

**SUCCESSFUL SECURITY**

To maintain security even as it establishes more connections to outside users and systems, Mitschke reports that the FDI specification uses multiple layers. Improving its security on an ongoing basis is another FieldComm Group initiative.

“All FDI packages have digital signatures, which authenticates that software is coming from a trusted source, and indicates if it’s been modified,” explains Mitschke. “The FDI environment can also be implemented as a client on a server architecture, in which case we can rely on OPC Unified Architecture (UA) and its certificate-based security.”
The Legendary Boy

Scout motto is “be prepared,” but even they would need to play serious catch-up to equal all the design, setup, configuration, commissioning, testing, smart instrumentation and predictive/proactive maintenance integrated into Royal Dutch Shell’s Prelude, the world’s largest floating liquid natural gas (FLNG) production facility. In fact, though configuration and maintenance don’t normally get as much glory as operational performance, Prelude’s testing and evaluation of its processes have been so extensive that it’s also earned the FieldComm Group’s Plant of the Year Award for 2016.

Having recently completed its long sail from South Korea to the Timor Sea off Australia’s northwest coast, Prelude is presently being stationed 200-km from the mainland. Once its connections to the local gas wells are established and final implementation is completed, it’s scheduled to begin regular operations in 2018. The 488-x 71-m vessel’s 14 production facilities, rising to about eight stories above the main deck and chock-full of FieldComm Group networking and technologies, will extract and process for transport about 3.6 million tonnes per year (Mtpa) of liquefied natural gas (LNG), 1.3 Mtpa of condensate and 0.4 Mtpa of liquefied propane gas (LPG) during its 25-year lifespan.

FieldComm on Deck

Beginning with Prelude’s initial designs and continuing through to its construction and upcoming operations, Shell’s engineers report that FieldComm Group technologies are essential in enabling the production facilities to perform their advanced diagnostics, intelligent operations and predictive maintenance, and achieve their lifecycle benefits.

“FieldComm Group technologies are used extensively in every phase of the Shell Prelude FLNG project, and form the backbone of the intelligent predictive maintenance system,” says Kyle Dickson, control and automation engineer for Shell Prelude FLNG. “The use of device templates is delivering excellent conformity and quality assurance throughout the commissioning process. This has enabled a small team to achieve impressive loop check rates whilst maintaining exceptionally high levels of quality assurance. Once commissioned, equipment and unit modules have used the extensive diagnostics and alerts provided by both HART and FOUNDATION Fieldbus technologies to great effect, specifically avoiding numerous plant trips and enabling unprecedented levels of remote support and deep-level diagnostics.”

Rong Gul, senior automation engineer and subject matter expert (SME) for smart instrumentation and instrument asset management with Shell Global Solutions, reports that Prelude’s process applications employ:

• More than 8,000 FOUNDATION Fieldbus devices, including 2,500 valve positioners, located on all control and monitoring devices, and connected only to the DCS;
• More than 4,500 HART devices connected to the DCS and PLCs via HART multiplexers, and used predominantly on devices connected to safety instrumented systems (SIS) and fire and gas (F&G) systems;
ValveLink and FDT/DTM on all complex instruments like guided wave radar (GWR) and valve positioners; and

WirelessHART on certain applications.

“In a nutshell, proactive maintenance was embedded from Day 1 on this project, rather than adding it as a work process on running facilities,” explains Gul. “Factory acceptance test (FAT) preparation and testing, training, templating, selection of smart instrumentation, rigid work processes, and a management and maintenance organization firmly supporting the technology are mandatory to make proactive maintenance succeed.”

TEMPLATES ENABLE “FIX BEFORE FAIL”

One of the most important tools used to prepare Prelude’s production facilities for consistent, optimal operations are default, commissioning or application-specific parameters that enable diagnostic features, device options or other functions. For example, pressure, Coriolis or valve positioning devices can have hundreds of parameters, so parameter settings can be stored in corporate or onsite template files, depending on individual device types or how and where they’re applied. These parameters in templates allow users to:

- Optimize diagnostics;
- Select features and options;
- Ensure error-free downloads to devices;
- Identify application and commissioning parameters;
- Apply consistent work practices at sites to utilize smart instrument data; and
- Eliminate error messages and unnecessary troubleshooting during commissioning.

Consequently, these templates streamline commissioning because they can be used to apply standard configurations to hundreds of FOUNDATION Fieldbus...
devices in a fraction of the time it used to require, which enables more effective and proactive maintenance at far less cost. “Using device templates ensures uniformity of device configuration, effectively reducing the number of commissioning parameters required to be checked by a factor of 20,” says Dickson. “The principle of ‘do it right, do it once’ is guaranteed by correctly using FieldComm Group technologies. The removal of regret/rework has resulted in significant cost/schedule savings throughout the commissioning process.

“In addition, using advanced diagnostics and rationalized device alerts enables predictive and targeted maintenance execution. Being in a particularly remote, isolated location, Prelude depends on having a fully realized, remote-monitoring group of engineers, conducting surveillance and advising on device issues. Commonly, it’s been possible to identify issues, specifically pertaining to control valves before the fault escalates and results in a plant upset or outage.

For instance, Prelude will draw 50 million liters of cold water from the surrounding ocean every hour to cool the natural gas, and help it bring it down to -162 °C. This is the temperature at which it liquefies into LNG and shrinks in volume to 1/600 of its gaseous state, which makes it much easier to transport. Smart devices performing this and other tasks on Prelude include control and safety valves; pressure, temperature and level transmitters for basic process control system (BPCS) and safety, flowmeters for BPCS and safety; fire and gas detection; and more.

Gul reports that implementing a proactive maintenance schedule for Prelude’s applications and components represents a game changer from traditional maintenance planning, allowing proactive maintenance to make informed, condition monitoring decisions, rather than relying on traditional reactive maintenance. “Coupling predictive maintenance data from the asset management suite with the criticality assessment of the field equipment provides a rationalized report, enabling prioritized maintenance activities.”

Gul adds the right parameter configuration of smart instrumentation and a fully functional IAMS
are crucial to enabling Prelude’s proactive maintenance schedule. Templates for all devices were configured during its FAT (Factory Acceptance Test) in Singapore, and Shell Global Solutions worked with Emerson Automation Solutions to develop required asset management functions. “As a result, FOUNDATION Fieldbus devices can be configured and loop tested six times faster compared to traditional 4-20mA HART devices,” says Gul, who provides training onsite to make sure Prelude’s operators have sufficient expertise in using the appropriate tools to diagnose and decipher alerts and other information.

**COMMISSIONING AND LOOP CHECK SAVINGS**

At the peak of its recent commissioning efforts, Dickson reports that Prelude’s staff was performing more than 500 loop checks per week, and checking multiple streams of complex functions. The vessel’s utilities plant was also running 24/7, which made maintenance challenging. Thanks to using templates for its parameters, Prelude’s staff and contractors achieved:

- Total time savings of 80% for device commissioning and loop checking across all devices that applied user configuration via templates and test devices using full-loop check procedure during FAT—not just commissioning devices in the asset management system;
- Time savings for the valve positioner loop check procedure was more than 80% for the full loop test;
- Tested all device types able to be tested in the FAT in less than three days, compared to previous test using traditional methods, which took more than two days to test just three device types; and
- Human error during FAT was identified quickly with reporting tool allowing for correction on the spot, whereas previously it was a tedious exercise to find a mistake with dozens of parameters and multiple screens.
“All benefits as we’ve gained so far are on Foun-
dation Fieldbus only,” adds Gul. “On average, a
trained team can perform a loop check on 20 Foun-
dation Fieldbus devices per day, including a mix of
valve positioners to temperature transmitters, and
maybe three to five HART devices.

REMOTE MONITORING, COLLABORATION
Beyond all the monitoring and control systems
onboard Prelude, Shell is also establishing a Col-
laborative Work Environment (CWE) at its local
headquarters in Perth, Australia. The facility will
seamlessly meld telepresence; live/historical process
data; live–historical diagnostics; document shar-
ing; and wireless personal video feeds. It will also
link Shell and its Global Vendor Support Center
to support engineering to optimize production and
minimize upsets by using scenario modeling and
test runs of plant modifications.

“Perth CWE is connected using fiber-optic links
to Prelude, which will only be staffed during normal
work-hours,” explains Gul. “Hence, it’s more suited
for reliability and day-to-day work planning, rather
than ad-hoc problem identification and trouble-
shooting, especially after normal working hours.”

Just as the templates save time, Gul adds that
Shell and Prelude are also embracing the Industrial
Internet of Things (IIoT) because it can:
• Improve safety by helping Prelude’s predictive
maintenance program and advanced, remote
diagnostics capabilities reduce field time for
personnel.
• Improves reliability by increasing equipment and
plant availability, which is critical for Prelude’s
single-train LNG application; and
• Assist production with live data feeds to Shell’s
dynamic simulator and predictive models, and
providing a full, live view of all process and
diagnostic data.

“We’re aligning our work processes and organiza-
tion to a fully connected, remote LNG plant made
possible by IIoT,” says Dickson.

“However, our goal of fix it before it breaks will
still depend predominantly on the right alert con-
figuration, criticality ranking, and swift reaction on
identified device alerts,” concludes Gul. ●

Contact us today!

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YOUR PATHWAY TO THE IIoT

**FDI - THE BETTER WAY OF FIELD DEVICE INTEGRATION**

FDI unifies device drivers, configuration tools, diagnostics and documentation regardless of operating system with an independent and downloadable software package compatible with any FDI registered host system.

FieldComm Group is a global organization with a mission to develop, manage and promote process automation standards.

FieldComm Group, fieldcommgroup.org

SENSE AND UNDERSTAND VIBRATION

Digital and optimized for process control, the HART PCH420V vibration monitoring sensor provides users with valuable benefits. Simple connection to existing plant infrastructure is a key reason plants need to use the PCH420V vibration sensor. Important features include HART 7.0-compliant, three-configurable bands, remote field-configurable scale and frequency range, hazardous location approval and multiple connector choices.

Put the HART PCH420V to work in your plant and address common problems including lack of understanding of vibration in process departments. Typical users include instrumentation engineers, system engineers, operations, and process automation specialists. It’s ideal for oil & gas and chemical processing industries. Convenient to buy online or request a quote.


SIL 3-CAPABLE SSX AND SST SAFETY ISOLATORS

Moore Industries’ SSX and SST Safety Isolators and Splitters provide reliable isolation and pass valuable HART® data in Safety Instrumented Systems (SIS) and process control settings. Part of the Moore Industries FS FUNCTIONAL SAFETY SERIES, these exida-approved, SIL 3-capable isolators have been designed and built from the ground up to the strict IEC 61508:2010 standards for safety-related applications.

The SSX and SST protect safety systems by isolating an SIS from basic process control systems so that disconnections or other failures don’t impact the safety system. While most isolators “strip off” HART data, the SSX and SST pass along HART data to asset management systems, programming devices or host systems.


ETHERNET HART MULTIPLEXER

Phoenix Contact’s new Ethernet HART multiplexer provides a simple way to parameterize and monitor up to 40 HART devices on an Ethernet network. The GW PL ETH series features a modular design and is an up-to-date replacement for the widely used RS-485 HART multiplexer solution. It offers integration via HART-IP, Modbus TCP, or PROFINET. Additionally, using the included CommDTM, the multiplexer and connected HART devices can be integrated into an FDT Frame application.

Designed for applications like partial-stroke testing, valve diagnostics, and batch-data transfers, the multiplexer features a HART master on each channel for the fastest possible updates and execution times.

For more information, visit www.phoenixcontact.com and enter #1567 in the “Search” bar.

Phoenix Contact, www.phoenixcontact.com
## Recently Registered Technology

These products have been registered since July 30, 2016. View an additional 44 FOUNDATION Fieldbus and 38 HART devices that have recently received updated certifications by visiting [go.fieldcommgroup.org/registration-all](http://go.fieldcommgroup.org/registration-all).

### New Registered Host Systems

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### New Registered Devices

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**ENDRESS+HAUSER’S NEW TABLET FOR UNIVERSAL DEVICE CONFIGURATION**

Field Xpert SMT70 is a high-performance, ruggedized, industrial tablet. Equipped with touch-optimized configuration software and preinstalled device driver libraries, it supports many industrial communication protocols. It offers one-click connectivity, 20 languages, NAMUR NE 107 device diagnostics and Heartbeat verification. An update service ensures the latest functionality and maximum security.

Endress+Hauser
www.endress.com/SMT70

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**INDUSTRY’S FIRST WIRELESSHART® PRESSURE GAUGE**

Reduce pressure measurement maintenance challenges, improve personnel safety and access field data continuously with Emerson’s Wireless Pressure Gauge. Proven sensor technology provides over-pressure protection. Information viewed locally via a dial and LED diagnostic indicators. Pressure readings and diagnostics are transmitted as frequently as once per minute.

Emerson Automation Solutions
www.Emerson.com/

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**CONVERT PROTOCOLS WITH EASE**

A new, unique series of protocol converters can take you from Modbus RTU or HART to Foundation Fieldbus, Profibus DP, Profibus PA, HART and WirelessHART. Simple configuration. Temperature range: -40 C to +85 C. Each converter handles 4 devices. Minimum investment. Short time to market. Delivery within 2 weeks.

Fieldbus International
www.fint.no, +47 22131910

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**NEXT-GENERATION MASS FLOWMETER WITH FIELDCOMM PROTOCOLS**

The next-gen ST100 Series Flowmeter for air/gas flow measurement and plant communication from Fluid Components International (FCI) features the FieldComm protocols including both Foundation Fieldbus and HART. It is the first triple-variable instrument that measures mass flow, temperature and pressure. In addition to flow rate, totalized flow and temperature, pressure measurement up to 1,000 psi (70 bar) is available. An on-board data logger stores 21 million readings on a removable card.

Fluid Components Intl.
www.fluidcomponents.com

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**YOKOGAWA YTA710 TEMPERATURE TRANSMITTER**

YTA710 temperature transmitter is highly accurate. The sensor input can be choice of single or dual inputs. This input can accept thermocouple, RTD, ohms or DC millivolt inputs and converts it to 4-20 mA DC with HART 7 or Foundation Fieldbus signal for transmission. HART type is certified as complying with SIL 2 for safety requirements.

Yokogawa Electric Corporation
www.yokogawa.com/solutions/products-platforms/field-instruments/

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**ENABLE YOUR DEVICE WIRELESS**

Microcyber’s A1110 adapters connect 4-20 mA, HART and Modbus devices to WirelessHART, supporting loop, external power and battery. Using Microcyber WirelessHART technology to transmit additional HART information such as process and diagnostics data to host system is reliable, secure, flexible and smart.

Microcyber Corp.
www.microcyber.cn/industrialwireless/
Calendar

For up-to-date information, see “Events” on www.fieldcommgroup.org

**Rockwell Automation**
**Process Solutions**
**User Group**
Houston, TX, USA
November 13-14, 2017

**ARC Industry**
**Forum**
Orlando, FL, USA
February 12-15, 2018

**HART Fundamentals**
Bangalore, India
February 12-13, 2018

**Device Integration (EDD and FDI)**
Bangalore, India
February 14-16, 2018

**FieldComm Group**
**Working Group**
Meeting
Bangalore, India
February 19-23, 2018

**HART Fundamentals**
Germany
April 9-10, 2018

**Device Integration (EDD and FDI)**
Germany
April 11-13, 2018

**HART Fundamentals**
Austin, TX, USA
April 23-24, 2018

**Device Integration (EDD and FDI)**
Austin, TX, USA
April 25-27, 2018

**Advanced principles of FOUNDATION Fieldbus**
Germany
May 15-17, 2018

**Advanced principles of FOUNDATION Fieldbus**
Austin, TX, USA
June 5-7, 2018

**FIELDCOMM GROUP**
**CURRENT COURSE OFFERINGS**

**Introduction to HART Protocol**
Available Q1 2018, this self-paced, e-learning workshop covers the basics of HART communication protocol, as well as an overview of the HART market and technology.

**HART Fundamentals and QA Testing Workshop**
This workshop is an intensive two-day course covering all aspects of HART communication protocol. You will gain the information needed to develop new HART-enabled products, support existing products and design systems that utilize HART technology.

**Device Integration - Writing EDD and FDI Package Workshop**
An intensive three-day course where developers learn the step-by-step process for building a Device Description for a HART- or FOUNDATION Fieldbus-enabled device based on Electronic Device Description Language (IEC 61804-3, EDDL) for use across all DD-enabled host platforms.

**Introduction to FOUNDATION Fieldbus**
Available Q1 2018, this self-paced, e-learning course for developers, end users, marketing professionals and applications engineers assumes little or no prior knowledge of FOUNDATION Fieldbus, but students should be familiar with process control. Students will learn the basic concepts and terminology related to the FOUNDATION Fieldbus integrated architecture and gain a working knowledge of the technical foundation upon which the technology is built.

**Advanced Principles of FOUNDATION Fieldbus**
This workshop is an intensive three-day course covering all aspects of the FOUNDATION Fieldbus protocol. Students will learn the skills required to develop new FOUNDATION Fieldbus products, support existing products and design systems utilizing FOUNDATION Fieldbus technology.
Vibration monitoring
HART-enabled field configurable vibration sensor

➤ Digital & optimized for process control

➤ Three user configurable bands

➤ Integrates with existing controllers

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Endorsed by leading end user groups like NAMUR and supported by all major automation system technologies including FOUNDATION Fieldbus, HART, PROFIBUS and OPC, FDI is making it easier for automation suppliers to develop and integrate intelligent devices.

FUTURE-PROOF INSTRUMENTATION INTEGRATION

Jointly developed over 5 years by the world’s largest Distributed Control Systems suppliers – ABB, Endress+Hauser, Emerson, Honeywell, Invensys, Siemens, and Yokogawa – FDI is revolutionizing field device integration technology and best practices.

FDI - THE BETTER WAY OF FIELD DEVICE INTEGRATION

FDI unifies device drivers, configuration tools, diagnostics and documentation regardless of operating system with an independent and downloadable software package compatible with any FDI registered host system.

INDUSTRY WIDE SUPPORT AND INTEGRATION

Endorsed by leading end user groups like NAMUR and supported by all major automation system technologies including FOUNDATION Fieldbus, HART, PROFIBUS and OPC, FDI is making it easier for automation suppliers to develop and integrate intelligent devices.

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