DIGITAL TRANSFORMATION IN THE AGE OF IIoT

How FieldComm Group Technologies Help Create New Value

White Paper

Executive Summary

In the industrial and manufacturing sector, it's important to make the most of the information provided by intelligent measurement devices. The usefulness of this information depends on access to and use of real-time, reliable data, allowing smart choices to be made. Integrating the data so that effective action gets taken depends on a network infrastructure that breaks down traditional "silos of information."

Current developments such as the Industrial Internet of Things (IIoT) and Industry 4.0 are focused on digital transformation of the field device network. This will help industrial organizations transition from reactive to predictive maintenance and optimize asset management strategies to improve operations and reduce costs. The goal is to use digitally available information from existing, installed field instruments to improve safety, operations, and reliability. Plant floor to executive office real-time access is key to delivering value to the enterprise.

FieldComm Group technologies provide the means to connect and integrate digital information – and have for over 20 years. FOUNDATION™ Fieldbus, HART® and *Wireless*HART® devices can be the basis for digitization supporting IIoT initiatives. At the same time, the Field Device Integration (FDI™) standard greatly simplifies device integration and takes account of the various tasks over the entire lifecycle for both simple and the most complex devices, including configuration, commissioning, diagnosis and calibration.

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Today's Industry Outlook

For industrial organizations, the IIoT is the basis for digital transformation – creating new ways to better collect and analyze the tremendous amount of data created in their operations and turn that data into solutions to solve challenging problems.

In a highly competitive global marketplace, industrial organizations are dealing with the evolution of their businesses and operations, where the virtual world of information systems, the physical world of machines and the Internet have become one.

The convergence of Operational Technology (OT) and Information Technology (IT) is driving new methodologies for monitoring production processes to improve performance, lower costs and minimize risk. Mere connectivity of devices already allows valuable enhancements such as remote service and predictive maintenance, but, ultimately, the goal is to analyze data and gain detailed and comprehensive insights from assets, processes and products.

For modern manufacturers, data needs to become an integral part of the control and operating system. They require technology providing an optimum interface for planning and maintenance programs running in the plant. Manufacturers seek "digital intelligence" to manage hundreds or even thousands of assets from a single site or across an enterprise to address crucial operating demands. This includes effective tools to transform process

data into real-time knowledge regarding process performance, equipment health, energy consumption, and emissions monitoring.

Now, more than ever, industrial firms need to make sense of vast quantities of data having a critical impact on their performance. To support the variety of applications necessary within a manufacturing facility, information must be delivered with context so it can be understood and used in various ways by a variety of people.

Changing User Requirements

Management of industrial operations has become increasingly demanding. It's a case of navigating through the tangle of new data to find the needle in the haystack. Manufacturers need to create reliable production plans to meet market demands, and synchronize maintenance plans and operations execution – with the

mandate to be more productive. In other words, do more, do it better, do it with more agility and with fewer resources.

Just as important, plant owner/operators need to understand how well they are able to mature and improve the process of managing the performance of these tasks, and continuously deliver improved productivity and effectiveness.

For process industry firms, there is a real need to transform operations, with real-time instrumentation delivering better information and allowing faster implementation of decisions. An essential requirement for every company is to ensure the safety of people, assets and the environment, while optimizing the performance of processes and facilities (e.g., uptime, reliability, safety and compliance).

Growth of Automation

Technological advances have been the impetus for dramatic increases in industrial productivity since the dawn of the Industrial Revolution in the 16th century. The first industrial revolution was the mechanization of production using water and steam power. The second industrial revolution then introduced mass production with the help of assembly lines and electric power, followed by the third industrial revolution with the use of electronics and information systems to further automate production.

The fourth industrial revolution encompasses the technologies and concepts of the value chain organization. Originally known as Industrie 4.0 and comprising a set of technology principles set down by the German government, the globally adopted term Industry 4.0 relates to the previous three industrial revolutions, each of which heralded a turning point in production and manufacturing strategies. Industry 4.0 employs the concept of cyber-physical systems (i.e., linking real objects with information-processing and virtual objects and processes via information networks – including the Internet).
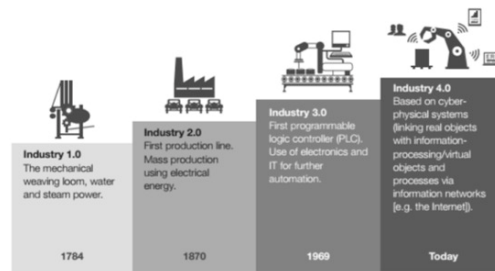

Fig. 1: Technological advances have been the impetus for dramatic increases in industrial productivity.

The aim of Industry 4.0 is to deliver greater flexibility to production and manufacturing processes by integrating the processes, data and organizational services of an enterprise. Industry 4.0 will make it possible to gather and analyze data across machines, enabling faster, more flexible, and more efficient processes to produce higher-quality goods at reduced costs. This, in turn, will increase manufacturing productivity, shift economics, foster industrial growth, and modify the profile of the workforce – ultimately impacting the competitiveness of companies and regions.

Understanding the IIoT

During the past 15 years, the growth and diversification of the Internet has redefined business-to-consumer industries. In the next 10 years, it will dramatically alter manufacturing, energy and other industrial sectors of the economy.

Dubbed the Industrial Internet of Things (IIoT), and in tandem with Industry 4.0 practices, the latest wave of technological change will bring unprecedented opportunities to business and society. It combines the global reach of the Internet with a new ability to directly control the physical world, including the machines, facilities and infrastructure that define the modern landscape. The adoption of the IIoT is being enabled by the improved availability and affordability of sensors, processors and other technologies that have helped facilitate capture of and access to real-time information.

Industry 4.0 employs the technological concepts of cyber-physical systems, the Internet of Things (IoT) and the Internet of Services to facilitate the vision of the smart plant or factory.

The Internet started in the 1960s, but it was not until the introduction of the World Wide Web in the mid-nineties that most businesses could start realizing the broad possibilities of the technology.
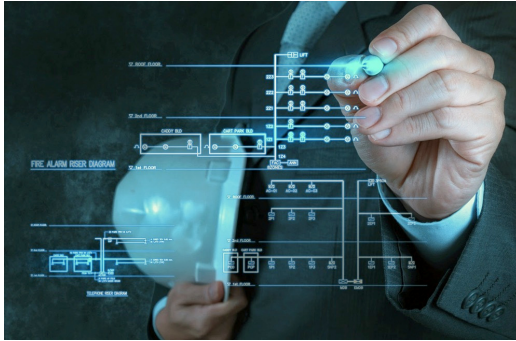

Fig. 2: The IIoT combines the global reach of the Internet with a new ability to directly control the physical world,

As the next big step in industrial performance and operations, the IIoT offers a wide range of potential uses and benefits:

- Enabling businesses to leverage the vast amounts of data provided by modern automation and control systems to make strategic decisions

- Providing trained personnel with improved remote monitoring, diagnostic and asset management capabilities

- Enhancing data collection even in the most dispersed enterprises

- Improving decisions about the actual health of assets

- Reducing the time and effort for configuration and commissioning

- Minimizing the need to troubleshoot device issues in the field

- Bringing production fields online faster

Communication protocols and standards form the backbone of the IIoT in that they enable the secure integration and interoperability of devices and software applications. This results in an always-connected framework with applications such as machine health, predictive analytics, performance monitoring, and asset monitoring readily layering on top of this infrastructure.

In the world of process automation, the IIoT

started with smart connected devices with unique identifiers communicating using a real-time digital network. This led to: having more sensors using fewer wires; more measurements in every instrument, with real- time status; the ability to freely add devices to a junction box without having to run cables all the way to the Input/Output (I/O) cards or add the I/O cards themselves; the ability to monitor self-diagnostics in an instrument from an office on the other side of the world; and the ability to put an indicator on the network to display values from transmitters and valves in inconvenient locations, or compute tank inventory or compensated flow from multiple sensors.

Without question, the possibilities of smart connected devices within an industrial plant are endless, and once a connection across the Internet is also provided this value can be extracted to varying levels within the organization.

A Revolution or Evolution?

The IIoT is often presented as a revolution that is changing the face of industry in a profound manner. In reality, it is an evolution that has its origins in technologies and functionalities developed decades ago. This technology has been evolving under different names, but there is now a wider acceptance on the market under the common umbrella IIoT.

Many manufacturers that have invested in smart instrumentation and control systems (i.e., HART and FOUNDATION Fieldbus) are now looking to leverage existing assets with the IIoT, rather than abandon or change them. There are also a number of organizations that have a long history in the advancement of automation products, driving innovation in open architectures and digital communication technologies that have been helping to guide companies through the IIoT transformation.

Since the introduction of the first smart transmitter in the 1980s, the market has seen continual growth of intelligent field devices that

Fig. 3: Manufacturers that have invested in smart instrumentation are now looking to leverage existing assets with the IIoT.

The Industrial Internet has major implications for process automation, but it is not something entirely new. Indeed, the basics of IIoT have been in the industry for a long time. End users have been moving digital information around their plants and to various hosts for years.

are now referred to as "things" with the IIoT. While the adoption of these "things" has increased, the approach to developing a more efficient, profitable and intelligent automation system is something that many stakeholders have been championing for decades.

Field level data can provide huge amounts of information, which, if mined, routed to higher levels and put into perspective is indispensable for the success of the IIoT. If the data can be presented in the proper context to a variety of different users, it can add real value to plant operations.

In the process industries, end user consortiums like the German chemical industry association NAMUR have put forth their vision for the IIoT, Industry 4.0 and the digital future. They acknowledge that while the large installed bases of legacy 4-20 mA devices are going to continue to exist, there is a strong justification for Commercial-off-the-Shelf (COTS) Ethernet to be used with field devices along with a common, deterministic network above the field level, and a management layer providing integration

technology and functioning as a gateway to serve data to various enterprise applications via the OPC Unified Architecture (UA).

Other stakeholders view industrial wireless technology as the answer to retaining large numbers of 4-20 mA HART-enabled instruments and still moving digital information into plant networks.

Depending upon an organization's role in the automation eco-system, its outlook on digital advancement is likely to be very product-specific, very architectural, or totally aspirational.

Value of Digital Transformation

Digital transformation – the use of technology to radically improve performance or reach of enterprises – is becoming a hot topic for companies around the world. Manufacturers are using digital advances such as analytics and smart embedded devices – and improving their use of traditional technologies – to change customer relationships, internal processes, and value propositions.

If manufacturers can fully leverage the benefits of digitization, all the way from core manufacturing out to the end-user experience, the opportunities are exponential because they can better use all of the available data in the enterprise.

Industrial systems that interface the digital world to the physical world through sensors and actuators that solve complex control problems are commonly known as cyber-physical systems. These systems are being combined with "Big Data" solutions to gain deeper insight through data and analytics.

Successful digital transformation comes not from implementing new technologies but from transforming industrial organizations to take advantage of the possibilities that new technologies provide. It also results from reshaping operational strategies to leverage valuable existing assets in new ways.

To get the most out of IIoT and Industry 4.0 technologies, and to get past square one with a digital business model, companies will have to adopt a new way of thinking. It starts with recognition that in-place analog solutions are sub-optimal and not provide the information needed to run complex industries facilities, coupled with the belief that networking and software technologies underpinning the Internet have a place in process automation. Finally, there is the act of leveraging global manufacturing technology initiatives by deploying disruptive new technologies to improve safety and performance.
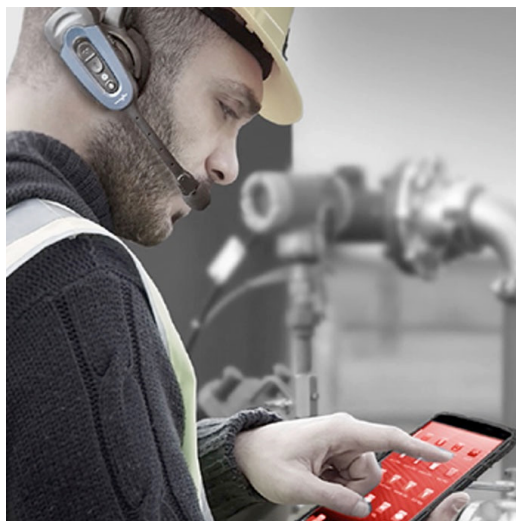
Fig. 4: The IIoT is enabling digital transformation by making use of the information contained in installed smart measurement devices.

The IIoT is enabling digital transformation by making use of the information contained in installed smart measurement devices. Simultaneously, industrial wireless continues to be a valuable, cost-effective solution for quickly adding more measurements to systems. Contributing to digital transformation of measurement data, wireless is being used for monitoring local and remote assets, safety, environmental and many different mobile and rotating measurements.

With a larger, consolidated data set, manufacturers can apply higher analytics for more detailed insight, scale the data as needed to meet the varied needs of single-site or enterprise-wide operations and leverage a wider pool of data experts for monitoring and analysis. Ultimately, digital transformation will help manufacturers eliminate unplanned shutdowns, maximize output, minimize safety risk and optimize supply chain strategies.

Role of Communication Protocols

The FieldComm Group, formed in 2015 with the merger of the Fieldbus Foundation and HART Communication Foundation, is dedicated to developing, managing and promoting global standards for integrating digital devices into automation system architectures while protecting process automation investments in the HART and FOUNDATION Fieldbus communication technologies.

The mission of FieldComm Group is to provide a unified vision for a smarter industry. No single automation protocol addresses all industrial use cases – particularly with wireless. Instead, today's environment requires secure plant floor to executive office data integration. FieldComm Group technologies provide the means to connect and integrate digital information. They enable a connected framework using intelligent field devices to reduce waste, improve safety and increase operational efficiency, and have for over 20 years.
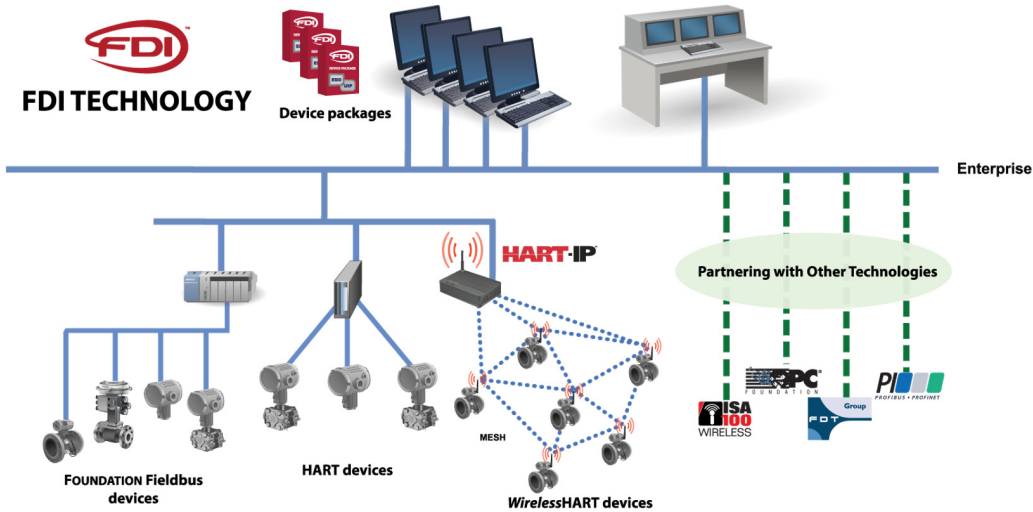
Fig. 5: FieldComm Group technologies provide the means to connect and integrate digital information via the IIoT.

Digital down to the sensor level, FOUNDATION Fieldbus has been at the forefront of digital transformation since its inception. The technology provides an all-digital communication infrastructure for process automation, with powerful multivariable measurement capabilities, robust device diagnostics, and the ability to integrate wireless devices across multiple networks. Its block structure is unique, enabling true distributed functionality, improved data management, and alarm and alert management.

FOUNDATION Fieldbus allows industrial organizations to unlock the full capabilities of their existing assets. By providing the means to leverage immense amounts of data generated by modern automation systems, the potential uses and benefits are numerous. They range from enhanced data collection and improved remote monitoring, diagnostics and asset management, to reduced configuration and commissioning effort.
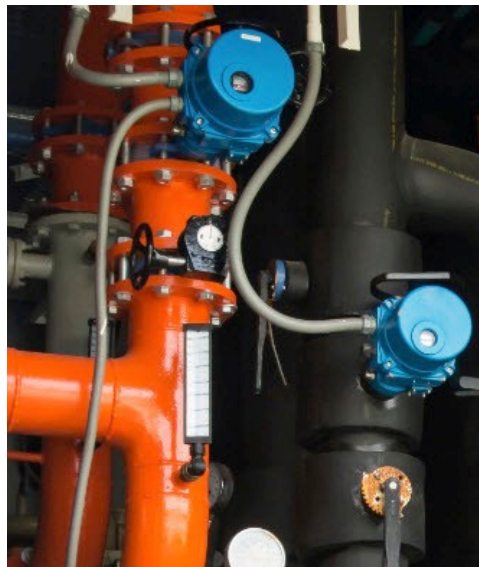

Fig. 6: Digital down to the sensor level, FOUNDATION Fieldbus has been at the forefront of digital transformation since its inception.

Designed for use with analog instruments, HART technology offers a proven, reliable, long-term solution for plant operators who seek the benefits of intelligent devices with digital communication, while preserving existing investments in analog instrumentation and plant wiring. Much more than a communication protocol, with HART technology process plants

have access to a wealth of digital process, maintenance and diagnostic information that is valuable throughout the plant lifecycle from design, to installation and configuration, through operation, and finally maintenance.

The bi-directional HART Communication Protocol provides two simultaneous communication channels – one analog, the other digital – and enables data access between intelligent field instruments and host systems. Communication occurs between two HART-enabled devices, typically a smart field device and a control or monitoring system. Standard 4-20 mA wiring practices assure reliable communication.

*Wireless*HART and HART-IP deliver the benefits of intelligent devices with digital communications while preserving existing infrastructure, training, control system and operational investments. *Wireless*HART is a wireless communications protocol that uses mesh network technology for process automation applications. It adds wireless capabilities to HART technology while maintaining compatibility with existing HART devices, commands, and tools. HART-IP enables the HART protocol to run over any Internet Protocol (IP)-based connection, offering valuable HART data at the speed of Ethernet and supporting intelligent device management for smart process instrumentation.

Fig. 7: *Wireless*HART and HART-IP deliver the benefits of intelligent devices with digital communications while preserving existing infrastructure and investments.
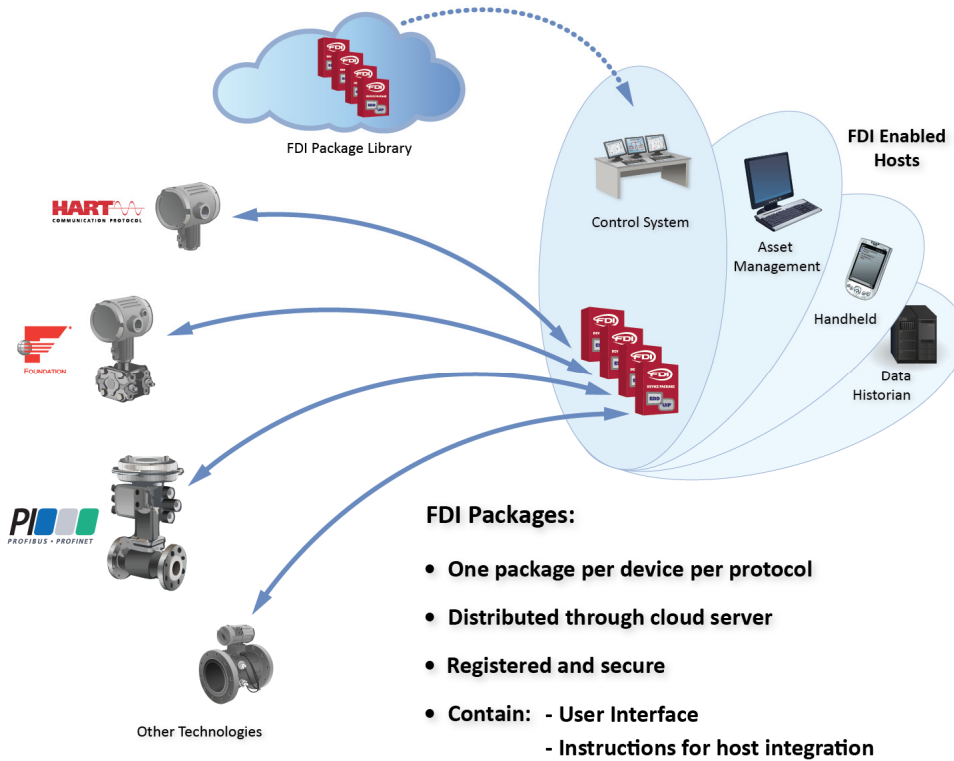
Overcoming Implementation

Challenges

The goal with IIoT is to secure data seamlessly and improve applications, but there's a large skills gap because many process engineers can't get data from devices using their current plant network. The technology also leaves room for improvement because, while end users want a dashboard of useful information they can streamline right to the top of their organization, they don't want to be inundated with data. It is important to prioritize the information coming from Programmable Logic Controllers (PLCs) and Distributed Control Systems (DCSs).

In recent years, there's been plenty of talk about the wall coming down between OT and IT, but there are still profound language and protocol differences between them. And, because IT-based protocols enable IIoT and Big Data applications, these language differences must be resolved for IIoT to succeed on the OT side. For example, IT staffs use high-level, data-exchange formats like XML and JavaScript Object Notation (JSON) as building blocks for web applications. To bridge the OT/IT gap, JSON and XML representations of intelligent field device data would be very valuable.

Just as most transmitters and other process control devices progressed from point-to-point, 4-20 mA hardwiring to twisted-pair fieldbuses and digital communications in recent years, IIoT is expected to further simplify and accelerate their networks and communications. However, process engineers and operators will need more IT know-how as IIoT moves down to the plant floor and out to the field to interact with so-called edge devices, which include all the usual sensors, instruments, valves, actuators, transmitters and other equipment

In this environment, the need for a universal, standardized and interoperable technique to comprehensively describe automation components is more important than ever. It is vital for everyday purposes like device configuration, device replacement, maintenance,

FDI Package Library

FDI Enabled Hosts

Control System

Asset Management

Handheld

Data Historian

FDI Packages:

- **One package per device per protocol**
- **Distributed through cloud server**
- **Registered and secure**
- **Contain:** - User Interface
  - Instructions for host integration

FDI is the path to the future. It has been specified and developed by leading technology foundations and major suppliers of process control systems and field instrumentation. The specification is also based on close cooperation with respected end user organizations.

diagnostics or audit trails – all essential building blocks in a modern field device management system. This description must be usable for all systems, independent of suppliers of devices, systems or tools. Without it, the true potential of decentralization, transparency, integration and a central view of all data and functions cannot be fully realized.

Solution for System Integration

Today's field instruments look more and more like embedded computers. Intelligent, microprocessor-based devices deployed across a wide choice of networks transmit a broad range of data that has never been available before. But increased data creates an information management dilemma. How can users take the huge volume of data created by intelligent devices and turn it into actionable information?

The first step is to simplify the procedures needed to access field device information by higher-level control or host systems. These procedures, known as integration, must be completed to assure proper device management

by the host, including device configuration, replacement, maintenance, and diagnostics. They must be standardized, usable across all systems, and independent of device suppliers, system suppliers, or vendor-specific tools.

Leading process industry foundations, including FieldComm Group, PROFIBUS International, and the OPC Foundation, jointly developed the Field Device Integration (FDI) standard to solve the problem of integrating field devices with the multitude of networks, operating systems, and control systems commonly used in process plants. FDI takes account of the various tasks over the entire lifecycle for both simple and complex devices, including configuration, commissioning, diagnosis and calibration.

The core of FDI technology is the scalable FDI Device Package, which describes a field instrument or automation component in all aspects. No other files are needed. The FDI Device Package incorporates a device specific Electronic Device Description (EDD) based on the harmonized Electronic Device Description Language (EDDL) per IEC 61804.

FDI Device Packages can be processed in FDI hosts as well as in an FDT2® Frame Application. This allows device suppliers to create a single FDI Device Package for their devices – instead of separate Device Type Managers (DTMs) and Device Descriptions (DDs) – while still providing users the choice of either an FDI host or an FDT host environment.

By including all tools, documents, and interfaces in a single device package, FDI improves system integration efficiency and allows easier access by IT organizations to OT information. Moreover, it 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.

Manufacturers and other industrial firms deploying IIoT applications can connect to valuable information in intelligent field devices – regardless of protocol – by using FDI to integrate the information in a process control system, asset management tool or Enterprise Resource Planning (ERP) system; then visualize and evaluate the data; and ultimately take action based on the information to prevent shutdowns, lower operating costs, reduce maintenance expenses, and become more predictive in how plants are run.

New Architectural Model

The Purdue Enterprise Reference Architecture has been a defining architecture for instrumentation, automation, manufacturing operations and business planning and logistics systems since its introduction in the 1990s. This pyramid model describes various "levels" of applications and controls in a manufacturing enterprise. It describes components from the physical levels of the plant (Level 0) through control equipment and strategies (Level 2). Level 3 describes the manufacturing control level, and Level 4 is the domain of Enterprise Business Planning, or Enterprise Resource Planning (ERP) systems.

With the emergence of the IIoT, however, and rethinking of the traditional process network view, two crucial questions for the automation industry are:

- Where will digital transformation occur?

- Where should the Internet Protocol (IP) network exist?"

Some believe digital transformation is most appropriate at the field device level of sensors and actuators with digital-capable devices, while others think the IP network should reside all the way down in safety-critical systems. In either case, security is an overriding factor.

Undoubtedly, the classic automation architecture is undergoing profound changes to accommodate IIoT operational strategies. It starts with the ability to connect data and integrate it across the enterprise – only then can value be captured. FieldComm Group protocols and technologies play a vital role at different layers of the new architectural model, and assist with a well-balanced IIoT approach that can be deployed today and effectively maintained well into the future.

At the bottom of the IIoT pyramid are "things" like transmitters, actuators, valves, controllers, monitoring systems, and other familiar equipment, as well as more recent developments such as video sensors and Global Positioning System (GPS) systems. Above the physical layer is a fabric of communication and control systems that manage field-level devices. This includes DCS, PLC and safety systems utilizing wired and wireless networks, Radio-Frequency Identification (RFID) networks, fiber optics and copper wiring, and run by local or remote operators. The third layer consists of IIoT platforms and processors that take information from a plant or multiple facilities, aggregate the data, and then support tasks such as predictive maintenance, asset management, advanced control, and Supervisory Control and Data Acquisition (SCADA). While all this information is valuable, it is not really actionable without a
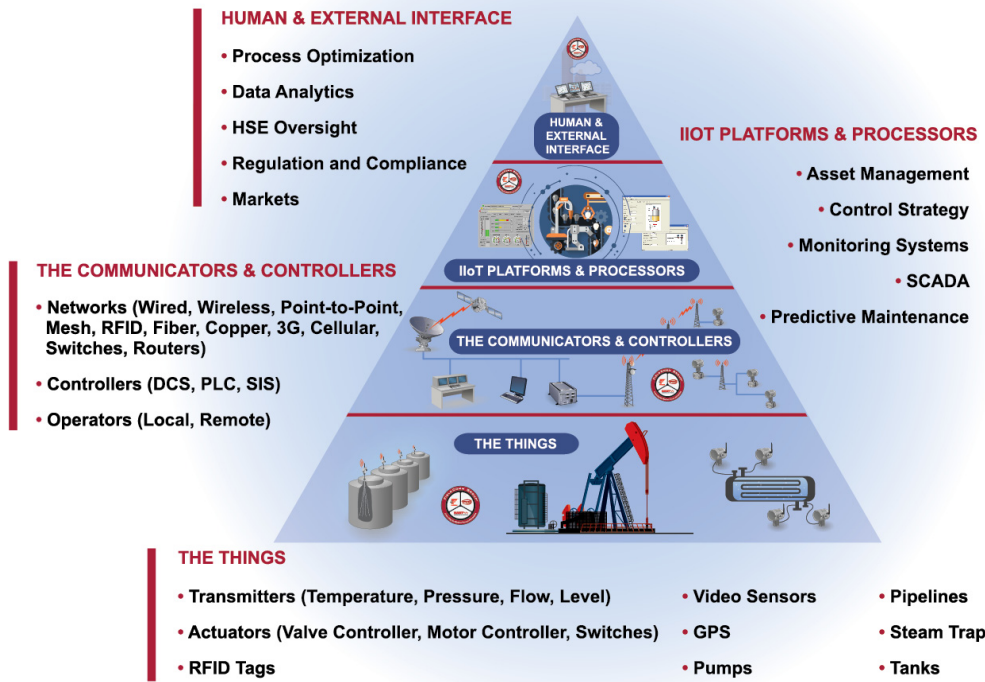
THE INDUSTRIAL INTERNET OF THINGS

HUMAN & EXTERNAL INTERFACE
- Process Optimization
- Data Analytics
- HSE Oversight
- Regulation and Compliance
- Markets

THE COMMUNICATORS & CONTROLLERS
- Networks (Wired, Wireless, Point-to-Point, Mesh, RFID, Fiber, Copper, 3G, Cellular, Switches, Routers)
- Controllers (DCS, PLC, SIS)
- Operators (Local, Remote)

IIOT PLATFORMS & PROCESSORS
- Asset Management
- Control Strategy
- Monitoring Systems
- SCADA
- Predictive Maintenance

THE THINGS
- Transmitters (Temperature, Pressure, Flow, Level)
- Actuators (Valve Controller, Motor Controller, Switches)
- RFID Tags
- Video Sensors
- GPS
- Pumps
- Pipelines
- Steam Traps
- Tanks

Fig. 9: FieldComm Group protocols and technologies play a vital role at different layers of the new IIoT architectural model.

Existing standards and technology will continue to advance, and will play a crucial role for decades to come, especially when it comes to providing IIoT connectivity and interoperability for the millions of existing devices installed across industry.

human & external interface at the highest layer that gleans insights from the various systems in place. These insights help decide what type of analytics to run, what processes to optimize, etc.

Based on the IIoT architectural model, system requirements include:

- Intelligent assets, connected intelligently by the appropriate communication protocol for a given application

- Data communications infrastructure with a span from the plant floor to the executive suite, and a scope that captures process data and intelligent asset information

- Analytics and applications to integrate asset data and deliver information

One of the core elements of the FDI specifications is an optional OPC-UA server that can be built into compliant products to seamlessly present data from field devices to higher-level systems. In the future, the FieldComm Group plans to offer a developer kit for connecting *Wireless*HART and HART-IP

devices into cloud-based systems. This would include a server platform allowing an IIoT content delivery gateway to provide information from devices on the plant floor up into cloud computing platforms and services like Microsoft Azure.

Beyond the aforementioned system requirements, there is no substitute for an invested and capable workforce that is trained and knowledgeable in enterprise systems. Operational executives are charged with making data-driven decisions, and Subject Matter Experts (SMEs) must interpret intelligence from all available information. These and other people make the difference for the business, whether it's business and risk analysis, or enterprise and supply chain planning.

Value to Industrial Organizations

As described in this whitepaper, the IIoT connects sensors to analytic and other systems to automatically improve operational and business performance. Savings from greater

utilization of digital intelligence creates more capital investment. Higher field reliability helps ensure increased uptime, safer operations, and greater efficiency. Advanced automation technology also raises productivity, manages assets over their entire lifecycle and optimizes experts' knowledge to drive profitable business results.

There is significant value to industry as a result of a smart connected device ecosystem, which makes it possible to address performance, reliability, safety, and environmental problems that have yet to be solved by traditional approaches. It is becoming possible to securely get the right information into the hands of problem-solvers wherever they are located, whether in a control room on-site or in a factory somewhere on the other side of the world.

One of the biggest opportunities for companies to realize IIoT benefits is to take advantage of the capabilities offered by plant floor to enterprise data management solutions. Although FOUNDATION Fieldbus, HART and *Wireless*HART technologies have been around for some time, the automation industry is still not utilizing their full capabilities, with a few notable exceptions. For instance, a 4-20 mA level transmitter simply evolved to became a fieldbus level transmitter or wireless level transmitter, whereas a digitally networked level transmitter can also provide multi-variables such as pressure and temperature measurement. Some advanced new devices like two-wire tank gauging systems, 4/8-input temperature transmitters, intelligent on-off valves, and other smart connected devices are already available, and more will be on the market soon.

Process industries and instrument manufacturers continuing to 4-20 mA and on-off signals should revisit plant automation architectures, product designs, and decide upon new business models to take advantage of the IIoT, since modern plants have already deployed it. Most new plants will be built on FOUNDATION Fieldbus, and existing plants will be modernized using *Wireless*HART.

Fieldbus and industrial wireless technologies are also changing how plants are designed.

Thanks to digital networking, end users can now deploy many more sensors in a plant because they pay for control loops, while the monitoring points are essentially free. This enables new business models like remote monitoring services to improve energy efficiency and reliability.

Fig. 10: One of the biggest opportunities to realize IIoT benefits is to take advantage of the capabilities offered by plant floor to enterprise data management solutions.

While the IIoT can utilize a vast number of connected industrial systems that communicate and coordinate their data analytics and actions to improve performance and efficiency, and minimize or eliminate downtime, there is no substitute for human experience and actions to improve operations and reduce costs.

Conclusion

The drive for digital transformation and smarter plant operations, as enabled by developments like the IIoT and Industry 4.0, can help manufacturing firms and other industrial enterprises leverage digital technologies to enable rapid deployment of new products, dynamic response to customer demands and real-time optimization of production and supply chain networks through interconnectivity of machinery, sensors and control systems. This approach also extends to asset management via predictive maintenance, statistical evaluation and measurements to help increase reliability.

At the heart of IIoT solutions for the process industries are FieldComm Group technologies helping automation suppliers and end users digitally connect to the data revealed by increasingly smart instrumentation, and to integrate the information with enterprise systems to advance business performance.

It's worth noting there is a global installed base of millions upon millions of FOUNDATION Fieldbus and HART protocol-enabled instruments. Information from those devices represents robust content for IIoT systems. The FieldComm Group is committed to enhancing the ease of use of its technologies to enable people – wherever they are located – to access critical data. The good news: there's no need to reinvent existing data models, since they have been proven over more than two-and-a-half decades of use.

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HART and FOUNDATION Fieldbus represent an essential platform for providing vital data, and these communication protocols are indispensable for supporting the Industrial Internet and Industry 4.0.

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