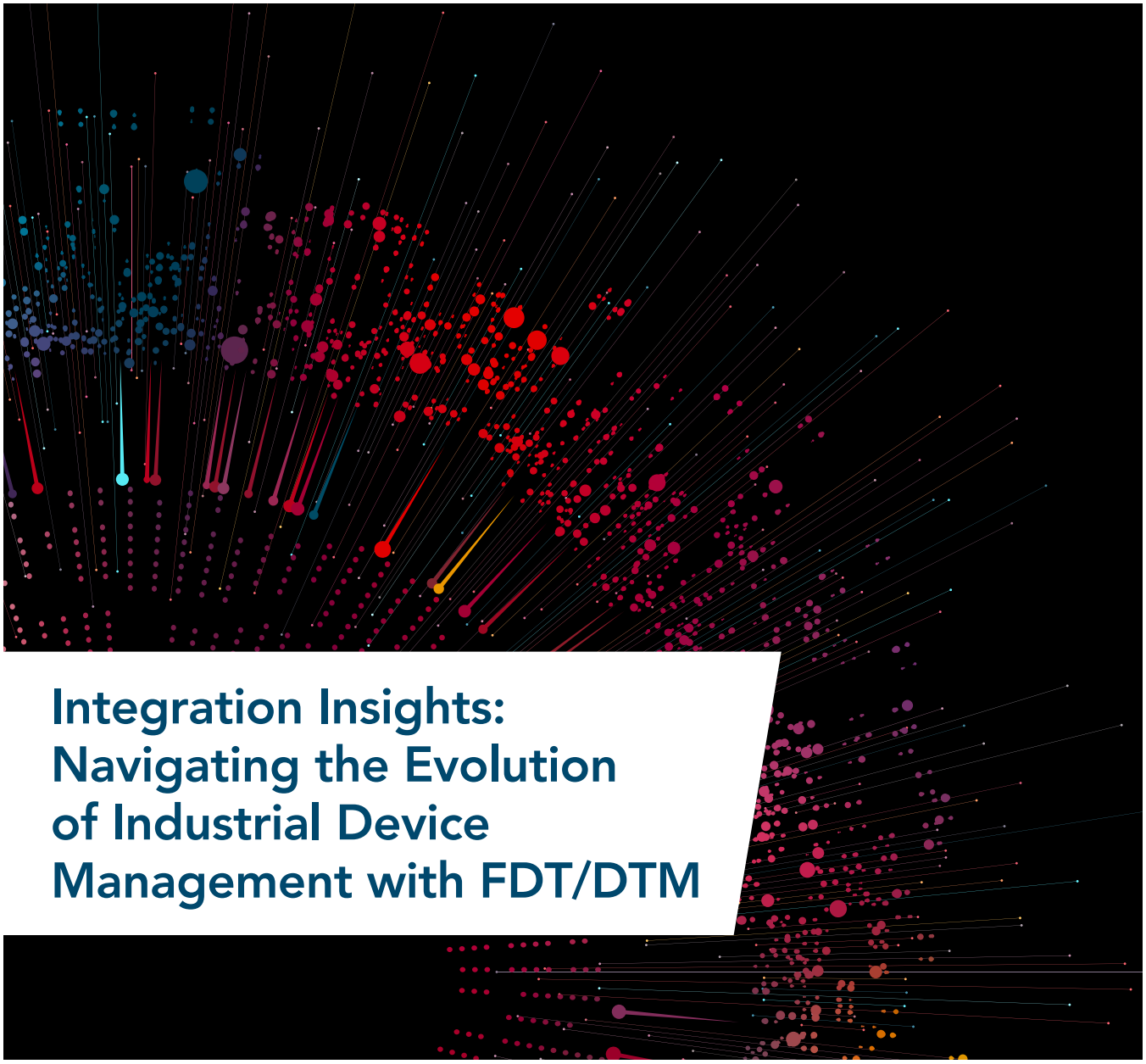
MAY 2024

Real-Time Data



Integration Insights: Navigating the Evolution of Industrial Device Management with FDT/DTM

FDT/DTM: The Collaborative Standard for Intelligent Device Management

Advancing device integration by fostering interoperability and data harmonization for the enterprise

Steve Biegacki – FDT Group Managing Director

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FDT Group Managing Director

Industrial automation is undergoing rapid evolution, driven by a push toward increased connectivity, data harmonization, and intelligent device management. The FDT Group, a leader in open and agnostic device management standards, is at the forefront of this transformation. We are spearheading initiatives to ensure seamless integration and interoperability across control system applications in the process, hybrid, and discrete markets.

The recent Hannover Messe marked a significant milestone in the realm of industrial automation. During the event, the FDT Group and FieldComm Group announced a strategic collaboration to form a single business unit. This partnership aims to advance device integration technology and harmonize control system applications across multiple protocol topologies. It addresses the industry's need for a cohesive approach to integration across both process and factory automation, enhancing engineering efficiency, boosting plant uptime, and elevating user satisfaction.

This strategic collaboration underlines FDT's role in fostering a unified solution for industrial device management. Under the FieldComm Group umbrella, FDT technology will thrive alongside sister technologies including FDI and PA-DIM. A new strategic integration committee will promote, manage, and maintain these integration standards, driving further innovation and interoperability. For more information on this exciting endeavor, please read the press release.

At Hannover Messe, the FDT Group co-exhibited with the OPC Foundation to demonstrate the power of FDT/DTM interfaces with OPC UA, UAFX, and Ethernet/APL, while also showcasing the modern FDT Unified Environment (UE) Server and the first FDT3-certified DTM from Flowserve.

These multi-vendor and multi-protocol demonstrations highlighted FDT's pivotal role in bridging today's installed base with tomorrow's innovative solutions while ensuring data harmonization and facilitating collaborations with higher-level systems and clients for comprehensive data exchange across the enterprise.

The potential of FDT technology to drive the industry forward to a modern, scalable solution fit for IIoT applications—including mobile applications and service-oriented maintenance—is becoming increasingly evident. We extend our gratitude to all the members who volunteered their time to support the FDT booth and the member community who generously contributed hardware and software solutions to make the demos successful.

As we look ahead to the upcoming ACHEMA event, the FDT Group will continue its collaborative efforts, co-exhibiting with FieldComm Group (Hall 11.0, Booth C14) and ODVA (Hall 11.0, Booth A3). Our focus remains steadfast on promoting FDT/DTM for intelligent device management, independent of platform, protocol, device type, or vendor, all within our Unified Environment.

We invite you to join us at ACHEMA in June as we continue our journey toward a future of seamless integration and innovation in industrial automation. Thank you for your continued support and dedication to advancing our industry. Together, we are shaping a smarter and more connected world.

VIDEO ROOM

IMPORTANCE OF FDT/DTM IN ETHERNET/HART APPLICATIONS

Kris Dornan
Commercial Marketing Manager
Rockwell Automation

NEW FDT HOST APPLICATIONS AND CERTIFIED DTMs

NEW DTM

Baker Hughes

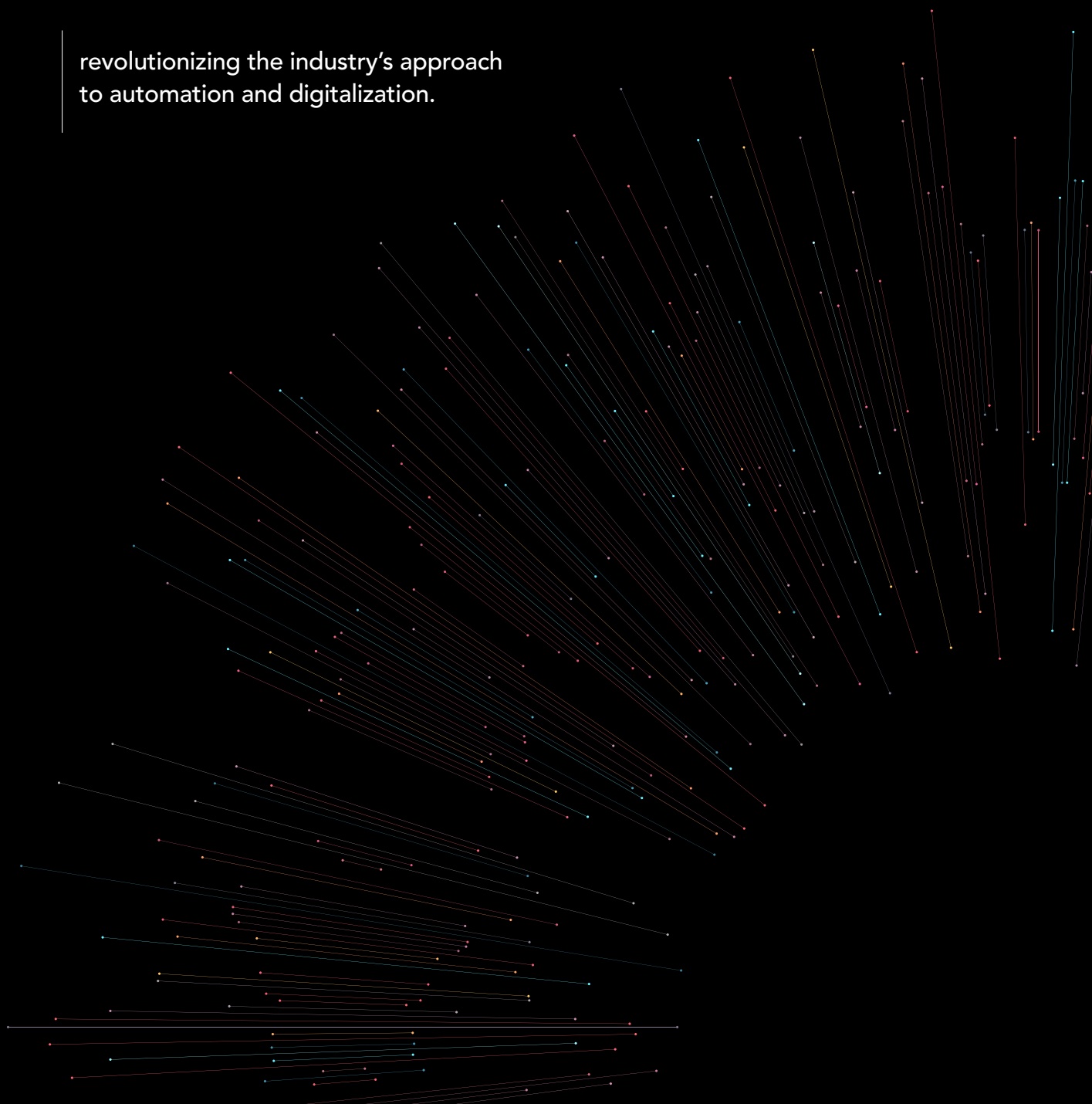
Baker Hughes
FDT Version – FDT 1.2

Protocol: HART

SV12AP_SV13DTM

Supported Devices:
SV13 Rev 1
SV12AP HART 5
SV12AP HART 6
SV12AP HART 7

revolutionizing the industry's approach
to automation and digitalization.



Revolutionizing Industrial Automation: The Impact of FDT and PI Technologies

Uncover the role of FDT technology in simplifying device integration, streamlining commissioning, and enabling advanced diagnostics of PI networks. Learn how these technologies paved the way for universal solutions, revolutionizing the industry's approach to automation and digitalization.

Two different worlds

Rockwell Automation's dominance in the North American automation market is reminiscent of Siemens' parallel influence in Europe. Like Rockwell, Siemens boasts a comprehensive portfolio catering to factory and process automation applications. Additionally, Siemens has significantly shaped digital communications protocols, notably with its proprietary device description file format, PDM, based on the DDL standard.

Siemens gained a substantial edge over competitors with its fully integrated software solution, which streamlined hardware integration complexities across various versions of Profibus protocol variants.

However, as industry trends favored open standards, the need arose for a standardized management entity for Profibus and its derivatives. This led to the establishment of the Profibus & Profinet International (PI) organization, aiming to universalize Profibus across diverse applications through tailored profiles and adaptable technologies.

One such technology pivotal to PI's mission is FDT/DTM, initiated by the ZVEI in 1998. This technology, finalized in 1999 and later overseen by PI, simplifies smart device commissioning through software drivers and standardized GUI, enhancing user experience and system integration for PLC suppliers.

The advent of FDT/DTM revolutionized the automation landscape, enabling PLC-based control systems to integrate diverse smart devices seamlessly, previously confined to proprietary protocols. This technology also served as a hardware abstraction layer, streamlining configuration tasks across multiple protocols and device vendors.

Moreover, FDT/DTM's uniform interface mitigated the need for specialized training and troubleshooting, contrasting with the fragmented interfaces of EDDL, its text-based counterpart.

Profibus technology, with its DP and PA variants, initially offered significant advantages such as interoperability and cost-effective decentralized I/O systems. However, evolving industry demands, and the rise of Industrial Ethernet eventually eclipsed fieldbus solutions.

The emergence of Profinet by the early 2000s demonstrated flexibility and efficiency in factory automation, even though facing challenges in process automation integration initially. Yet, Profinet's evolution, coupled with innovations like Ethernet-APL, promises seamless integration of smart field devices into industrial Ethernet networks, marking a significant stride towards Industry 4.0 and IIoT initiatives.

Profinet's extensive suite of services facilitates diverse industrial automation applications, fostering transparent access across enterprise-level networks and enabling IT/OT integration on a broader scale.

The evolution of automation technologies driven by PI has unlocked a myriad of applications across industries, heralding a new era of interconnected and efficient industrial systems.

The Profibus communication model employs two distinct methods of data exchange to achieve the deterministic network behavior crucial for demanding applications.

Hiding Unnecessary Complexity Using Different Paths

In a Profibus network, a Class 1 Master sequentially polled all connected nodes, which responded with I/O data. This cyclic process occurred within defined time frames, allowing nodes to answer the master's requests. Meanwhile, Class 2 Masters, utilizing periods of media downtime, could queue questions to connected devices.

Additionally, Profibus facilitated acyclic data exchange with connected nodes, allowing significant data collection and transmission. While this method lacked the determinism of Class 1 Masters, it enabled crucial exchanges like diagnostics, operation timings, and remote configuration, all without field intervention.

This prompted the birth of the FDT/DTM concept. Since Class 2 Masters, essentially Windows PCs, couldn't use GSD files for acyclic communications, a device description coded as a small program, called DTM, worked with a framework application, FDT/Frame Application (Desktop Windows application). This concept, essentially the first Edge device, revolutionized integration.

At that time, discussions comparing FDT/DTM with EDDL, a text-based competitor, were ongoing. EDDL's platform independence (e.g., from MS Windows) appealed to DCS suppliers accustomed to Unix systems.

Profibus featured two implementations: Profibus DP, an RS485-based serial fieldbus ideal for complex devices like RIO systems, and Profibus PA, leveraging the MBP protocol, offering power and communications to devices.

Profibus DP's simplicity and interoperability with various RIO systems were advantages, but Profibus PA faced challenges over time. Despite its benefits, Foundation fieldbus was preferred by DCS suppliers due to its user layer's compatibility with function block programming.

FDT/DTM's constant user interface across different systems minimized training needs, garnering strong support from independent device suppliers and control systems.

As the industry shifted to Industrial Ethernet, Profibus faced challenges. However, Profinet, introduced by PI, gained traction for its flexibility, particularly in Factory Automation.

Profinet's expansion into Process Automation faced obstacles due to integration challenges. Nonetheless, support for Ethernet-APL for this standard will enhance resilience and signifies ongoing evolution.

Ethernet-APL, a subset of SPE, promises a seamless transition from analog loops to digital networks, ensuring compatibility with existing protocols like Profinet.

Profinet's comprehensive suite of services enables various industrial applications, promoting transparent access across enterprise networks and IT/OT integration.

Through PI technologies, a myriad of applications became feasible over the years, showcasing continuous innovation in industrial automation.

Profibus evolution through application examples (with a little help from FDT)

Profibus DP-V1: Acyclic Data Exchange

The initial version of Profibus DP was dubbed V0, a name established for clarity following the introduction of V1. Profibus DP V0 exclusively facilitated cyclical data exchange. With the advent of Profibus DP V1, however, acyclic data exchange became feasible, ushering in the utilization of Class 2 masters. This advancement enabled remote configuration, parameterization, commissioning, and asset management practices through FDT technology.

The emergence of the first-generation FDT, tailored for RIO systems, capitalized on the modular device model embraced by PI. This development enabled remote detection of even minor faults, such as wire breakage or short circuits, on a per-channel basis.

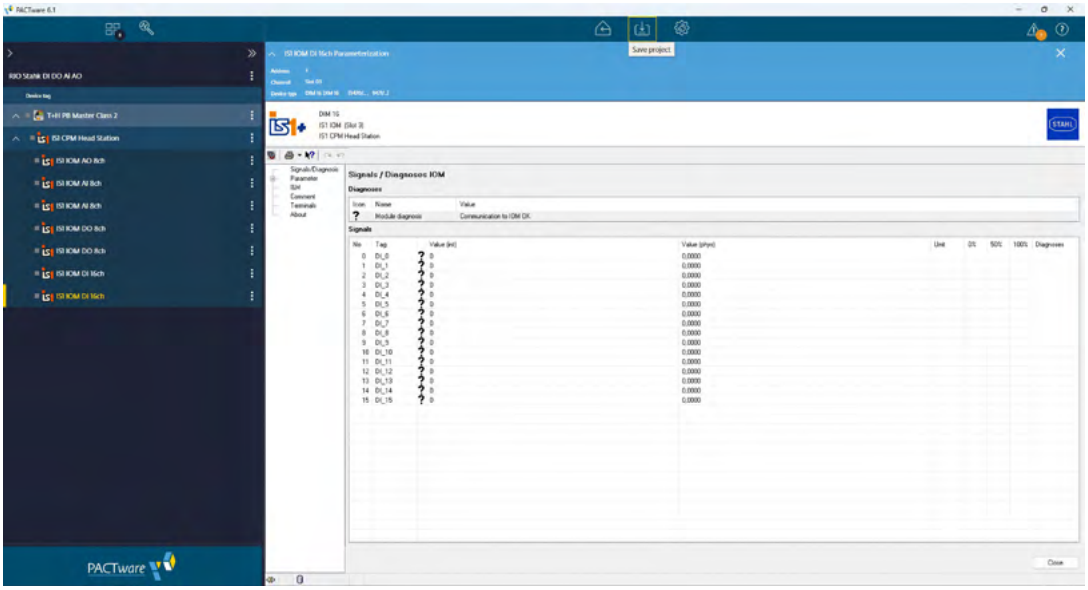


Figure 1: A Stahl IS+1 RIO system, with 7 standard multichannel I/O modules.
This system supports 32 DI, 16 DO, 16 Ai and 8 AO signals. A Trebing +Himstead adaptor acts as the Class 2 master.

The introduction of support for acyclic data exchange enabled the transmission of HART data from the field devices to the Class 2 Master, marking another stride towards digitalization. Initially, this configuration utilized generic HART DTMs.

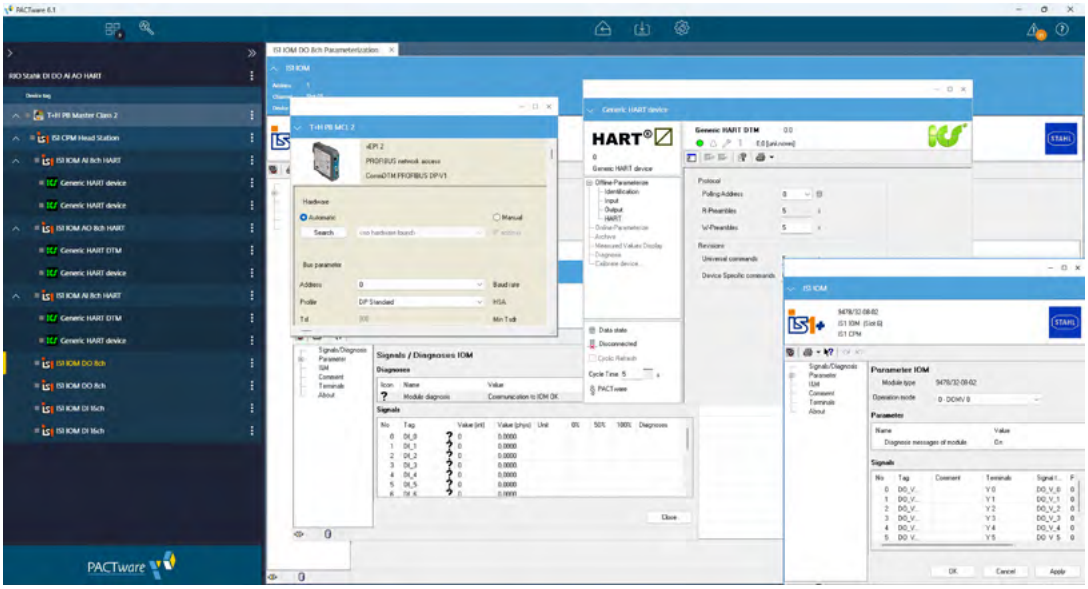


Figure 2: A Stahl IS+1 RIO system, with 7 standard multicahnnel I/O modules. This system supports 32 DI, 16 DO, 16 Ai +HART and 8 AO + HART signals. Generic DTMs were used initially, since full support from the industry was not yet available.

FDT/DTM and EDDL

FDT technology found itself in competition with another standard for device description, namely the EDDL standard, which represented an advancement over the original DD files used for HART devices. EDDL technology formed the backbone of Siemens' PDM asset management solution and Emerson's FHX descriptors included in the AMS device installation kits.

The widespread industry support for the FDT concept fostered a market for third-party DTMs, aimed at integrating field devices from manufacturers that did not offer FDT support. For instance, Siemens' ET200 series of RIO systems lacked FDT support, prompting independent companies like Softing AG and others to develop DTMs facilitating the integration of these devices into non-Siemens environments.

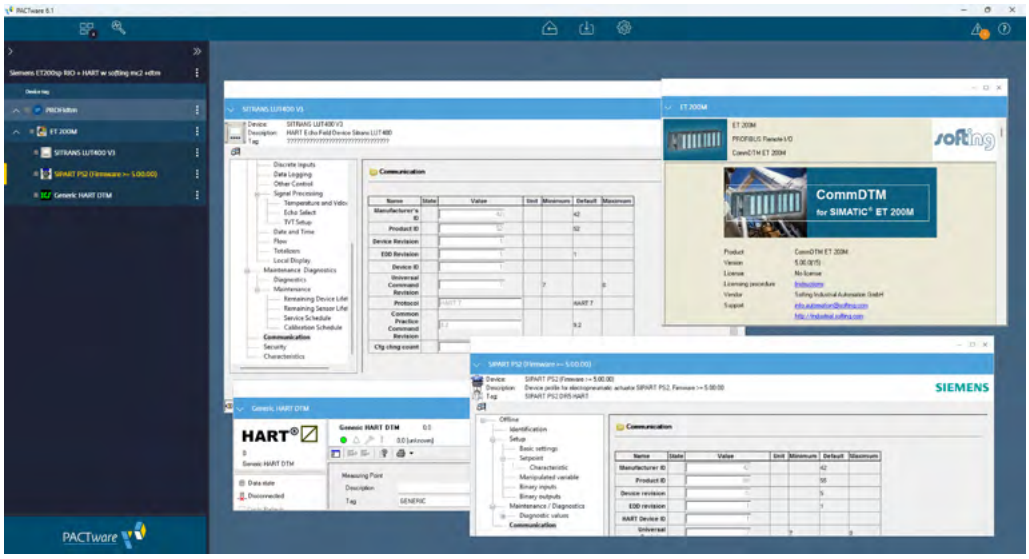


Figure 3: An ET-200M Siemens RIO system connected to a Softing adaptor working as the Class 2 master. The ET200 DTM works like a Gateway DTM for the connected HART devices corresponding DTMs.

Profibus DP V1 introduced the concept of nested networks, facilitating the integration of HART AI and AO I/O modules. These modules could now transfer data from connected field devices using acyclic communication methods, effectively transforming any HART I/O module into a HART gateway.

This innovative solution simplified the utilization of HART devices compared to traditional methods reliant on serial multiplexers, known for being slow, costly to install, and challenging to maintain. Profibus DP V1 thus provided a practical means to leverage HART technology.

Intrinsically safe Profibus remote I/O systems.

However, the initial generation of Profibus RIO systems lacked support for hazardous area applications, a common requirement in the Process Industry. To address this need, three alternative approaches emerged:

1. RIO systems equipped with a power supply capable of delivering intrinsically safe power levels to the I/O modules via IS power channels. When a channel reaches its limits, the remaining modules switch to the second IS power channel until all modules are powered or the power supply reaches its maximum output. Notably, this method obviates the need for a certified cabinet to be installed in a hazardous area, even in Zone 1 applications.

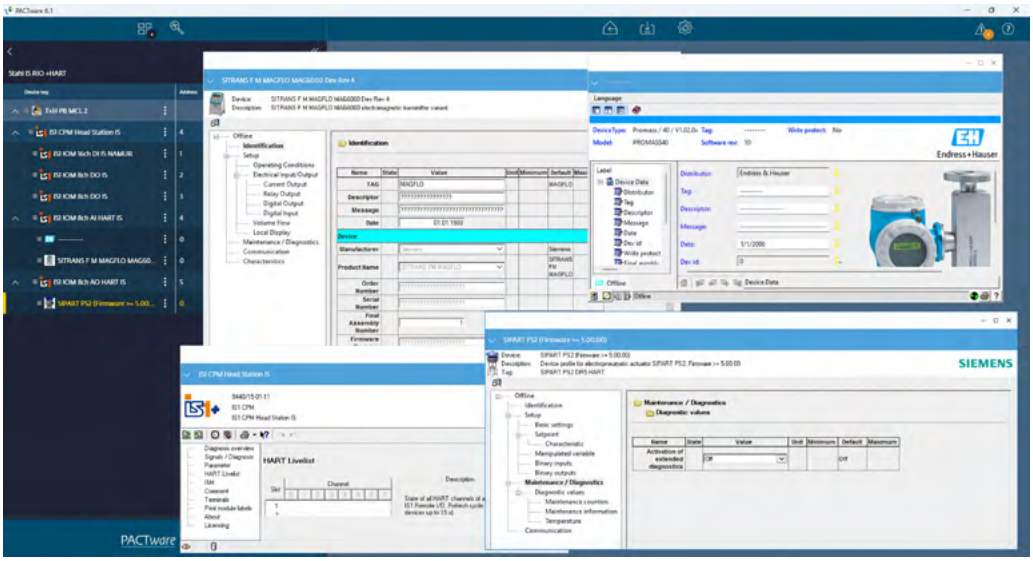


Figure 4: Stahl IS1 RIO system equipped with 5 galvanically isolated, IS I/O modules. The system has one 16 ch NAMUR DI module, one 6 ch DO module for IS solenoid valves, one 8 ch AI module and one 8 ch AO module with built in HART modems.

Stahl was the first to introduce such a solution, followed closely by Siemens, which notably did not support the FDT concept. Consequently, third-party suppliers stepped in to develop DTMs for the IS RIO solution.

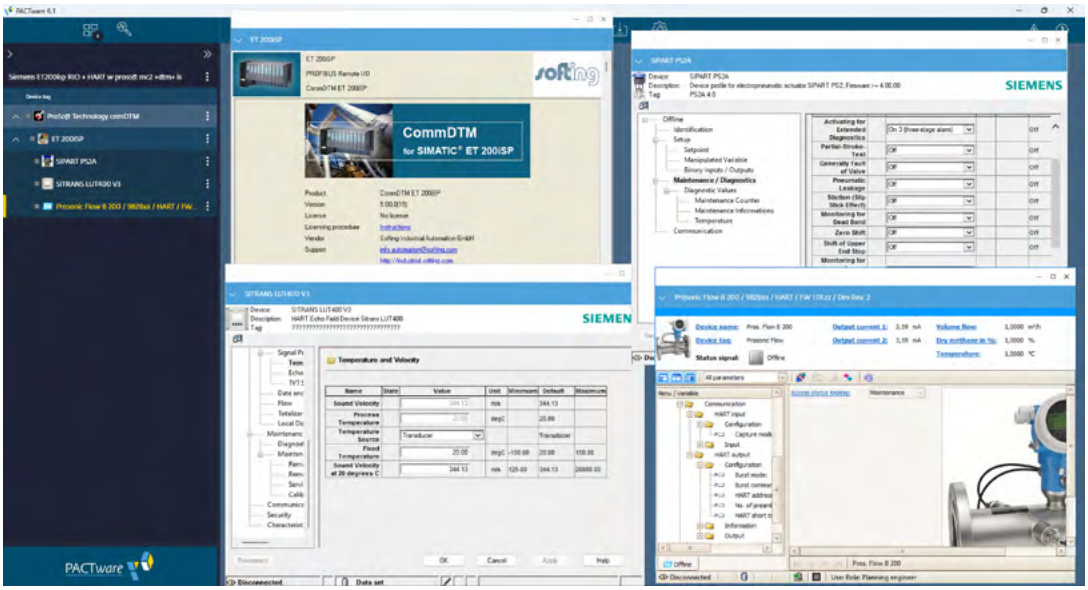


Figure 5: A Siemens ET 200ISP using a Softing DTM for integration into a Prosoft Class 1-2 master. The RIO system is intrinsically safe and works as a HART modem for connected field devices.

2. RIO systems utilizing backplanes equipped with Ex e protection. These systems necessitate the use of certified Ex eb increased safety cabinets for field mounting in Zone 1, which, while pricier than simpler non-certified counterparts, offer streamlined installations and performance. Their power supply typically comes at a lower cost compared to a multichannel IS one.

   Moreover, these systems allow for mixing Ex and non-Ex modules within the same cabinet, reducing the total number of required housings and yielding significant savings.

3. RIO systems with Zone 2 approval. This is the most frequently used solution. It offers slightly lower savings in cabling but deliver similar functionality to the previous options with much lower costs per I/O point. These systems require the use of Ex ec certified housings.

Rebranded RIO systems and Universal I/O modules

To minimize development costs, some DCS suppliers opted to offer rebranded versions of existing RIO systems or collaborate with experienced third-party suppliers to either design new RIO systems or adapt existing ones to their requirements.

For example, Turck's ExCom RIO system, originally developed by Turck, was also marketed as the S-900 RIO system featuring ABB colors and logos. Similarly, Rockwell's Flex IO Ex system was designed by P+F, which also sold it as the IS-RPI system.

These systems push FDT technology to its limits: each module is equipped with a DTM. Consequently, with an 8-channel DI module, users can configure each channel according to the application's requirements. Moreover, the built-in diagnostics enable the detection of wire breakages, identifying the malfunctioning module and channel with precision.

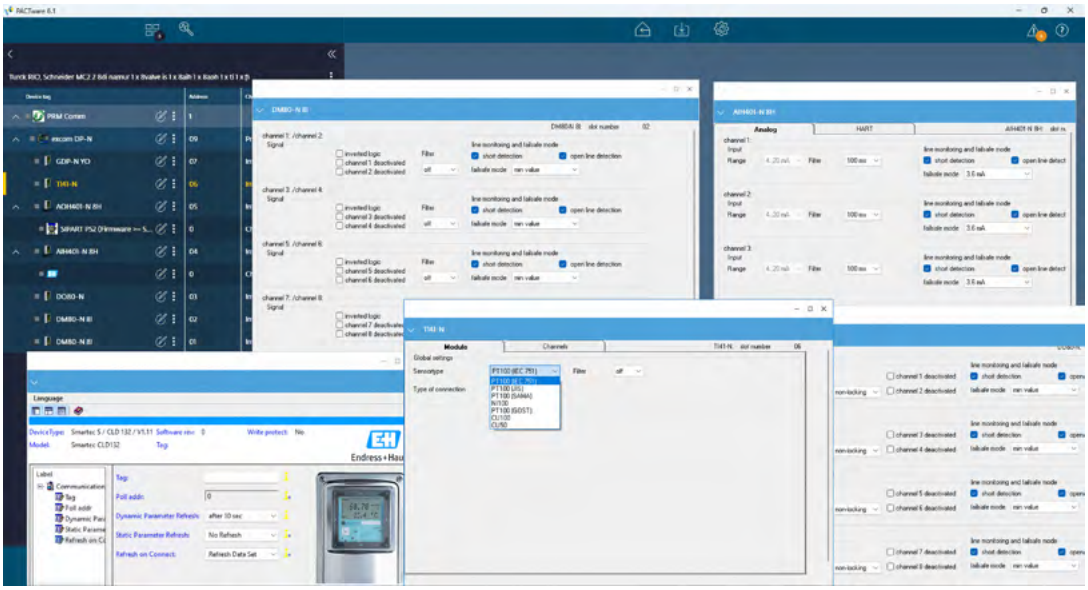


Figure 6: Turck´s Excom RIO system with these modules: 2x8 ch IS DI NAMUR, one 8 ch IS DO, one 4 ch IS AI HART, one 8 ch IS AO HART, a 4 ch temperature input and a frequency monitor- The HART data from the field devices is sent to an asset management workstation.

Another significant advancement in RIO systems was the introduction of universal I/O modules. Originating from the Smart I/O systems developed by major DCS suppliers, this innovation aimed to streamline I/O module variety by employing a single module configurable to connect DI, DO, AI, or AO signals via software. Each module encompasses the necessary electronics to accommodate any of these four primary types of I/O signals.

This approach offers several benefits, including a reduction in the variety of commonly used modules from four to one, resulting in fewer and more standardized spares and simplifying the marshaling stage. This concept seamlessly aligns with both FDT and Profibus DP technologies, owing to the modular nature of the device information model implemented in these standards.

While initially promising, the added electronics required to support the four different I/O signals increase the module's cost. Additionally, given the prevalent usage of DI signals in typical process automation applications, allocating one of the configurable module's channels for the most frequently used signal could render the overall installation expensive. Consequently, universal modules may prove more practical for AI/AO signals exclusively.

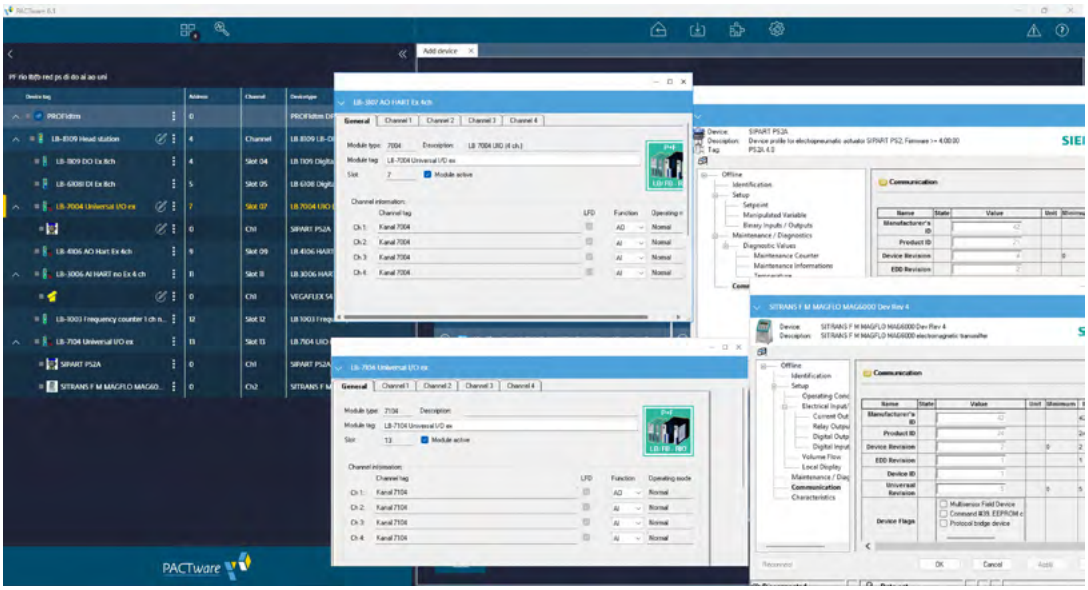


Figure 7: P+F´s LB RIO system equipped with Di, DO, AI, AO, frequency monitoring and universal IO modules, both in IS and non-IS versions.

Profibus PA and third-party solutions

PI's implementation of the IEC 61158-2 standard is known as Profibus PA fieldbus. This serial protocol utilizes the MBP (Manchester Bus Powered) encoding method to provide both power and communication to intelligent Profibus PA field devices. Due to differences in physical layers between Profibus PA and DP, a linking device is necessary to connect them. Initially, two alternatives emerged, evolving differently as Profibus DP increased in speed.

The available options were Siemens' DP/PA Link and P+F's SK2/3 segment couplers. Siemens' approach functioned as a RIO system for Profibus PA, while P+F's solution operated as a proxy server. Notably, Siemens did not provide FDT support, whereas P+F's approach did not require a driver or device description.

Third-party DTMs soon emerged to facilitate configuration of Siemens DP/PA links, while P+F's SK3 segment coupler offered an FDT/DTM-based fieldbus diagnostic module. Once again, the flexibility and adaptability of FDT technology positioned it as the optimal solution to meet industry demands.

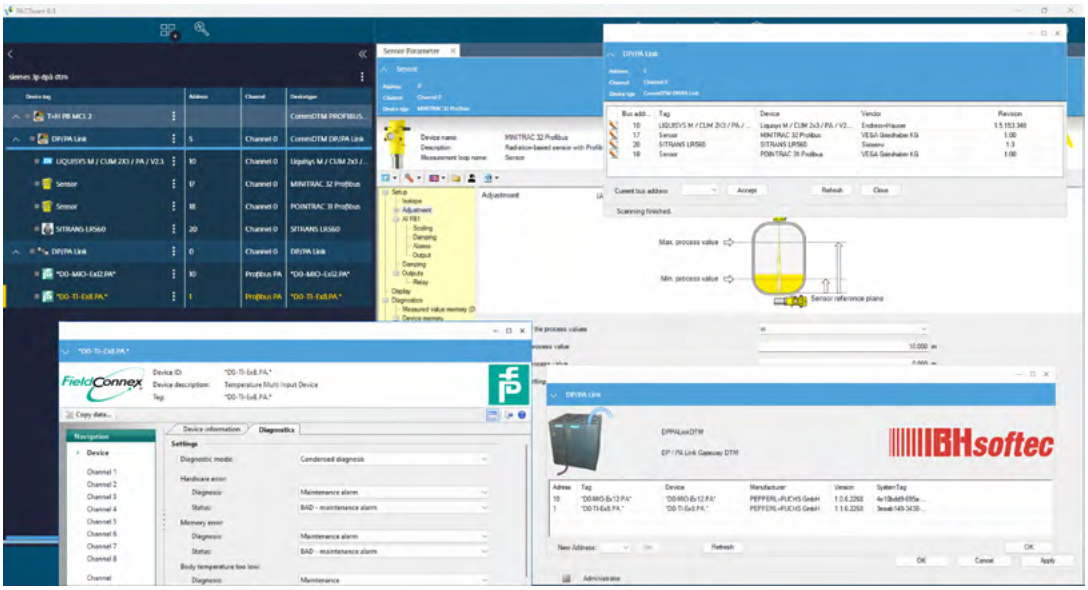


Figure 8: Siemens DP/PA links integrated in a FDT framework using third party DTMs supplied by IBHsoftec and Softing

Advanced fieldbus physical layer diagnostics

The option of running complex applications in the FDT framework using DTMs enabled several suppliers of PROFIBUS diagnostic tools to develop sophisticated diagnostic solutions. From handheld physical layer diagnostic tools to advanced applications that made diagnostic information available across Ethernet networks, to comprehensive commissioning tools that could be integrated with most major DCS suppliers, the FDT concept emerged as the premier method for implementing state-of-the-art PROFIBUS DP and PA installations.

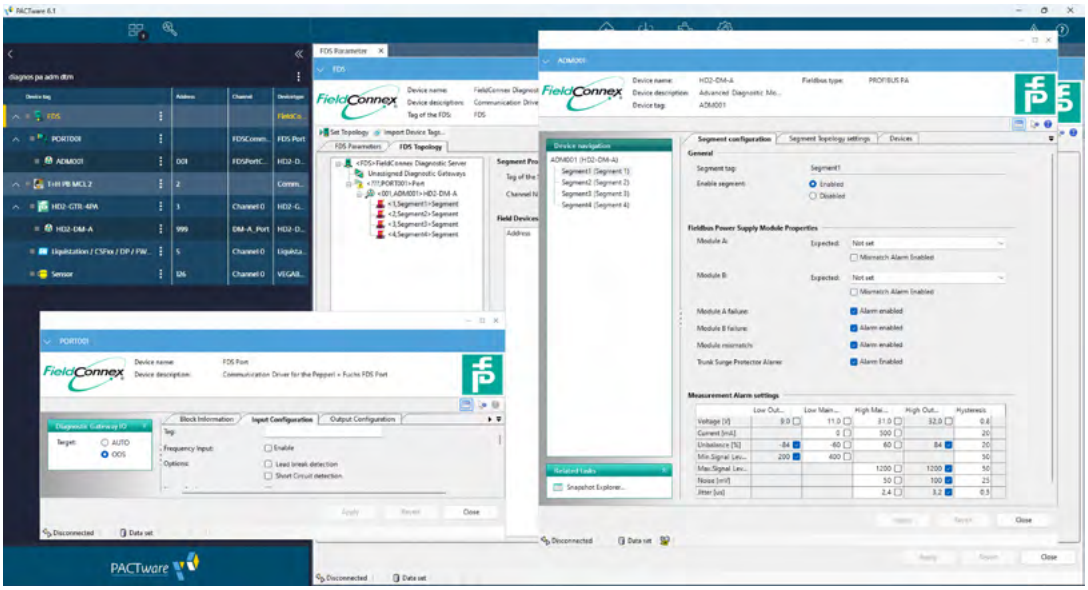


Figure 9: P+F´s Fieldbus Advanced Diagnostics sysytem solution, based on FDT technology, shown in stand alone and Profibus integrated setup options

The third generation of P+F's SK transparent DP/PA segment couplers included a modular fieldbus diagnostics solution, which is among the most ambitious FDT/DTM applications ever designed. P+F's diagnostics module can be utilized in various ways: integrated into the PROFIBUS network, as a standalone handheld device, or as a plant-wide, Ethernet-connected, FDT-based diagnostics network that can even interface with OPC.

By 2010, after several years of limited options, many solutions were available for connecting PROFIBUS PA networks not only to PROFIBUS DP but also to other protocols. The slower-than-expected adoption of FOUNDATION Fieldbus left process automation users who were interested in fully digital communication protocols with PROFIBUS PA as their primary choice.

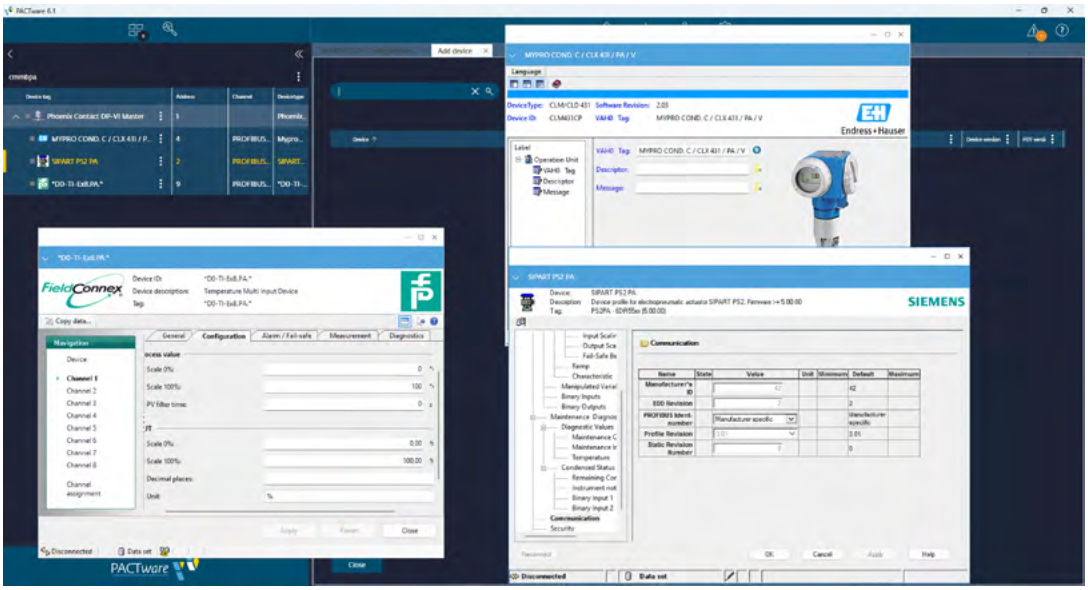


Figure 10: Diverse Profibus PA from Siemens, P+F an E+H field devices connected to a Class2 Master equipped with a Procentec/Phoenix Contact DP/PA coupler.

Procentec's CommBricks DP/PA coupler with integrated fieldbus diagnostics uses a DTM file for configuration. This device resolved a decade-long debate between advocates of P+F's transparent, proxy-like couplers and proponents of Siemens DP/PA PROFIBUS PA RIO-like systems. Procentec's innovative solution allows users to select the desired behavior via an option in the device's configuration.

The PROFIBUS standard, in conjunction with FDT technology, enabled the integration of both DP and PA network segments into other networks. Rockwell's Hiprom series of PA linking devices allowed the integration of PROFIBUS PA field devices into EtherNet/IP networks, gaining some acceptance in the mining industry before being discontinued, potentially leaving numerous plants without options.

Options for brownfield applications

The flexibility and widespread market adoption of FDT technology have created an interesting market for third-party suppliers of both PI-compatible hardware and software. This is particularly beneficial for brownfield plants that need to extend the lifecycle of their control system installations.

Aparian Inc. addressed the discontinuation of Rockwell's Hiprom-branded linking devices by developing a PROFIBUS PA to EtherNet/IP proxy, providing end users with an upgrade path.

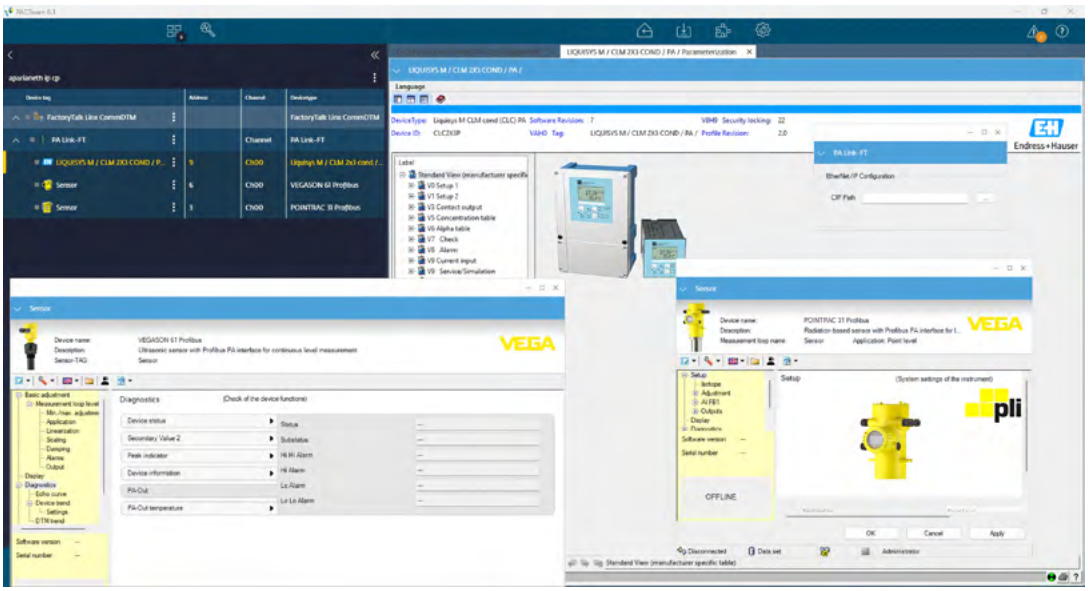


Figure 11: Profibus PA field devices connect to a Rockwell PLC using the Factory Talk Linx Comm DTM

Aparian also offers a FOUNDATION Fieldbus to EtherNet/IP interface, further expanding the integration options for industrial automation systems.

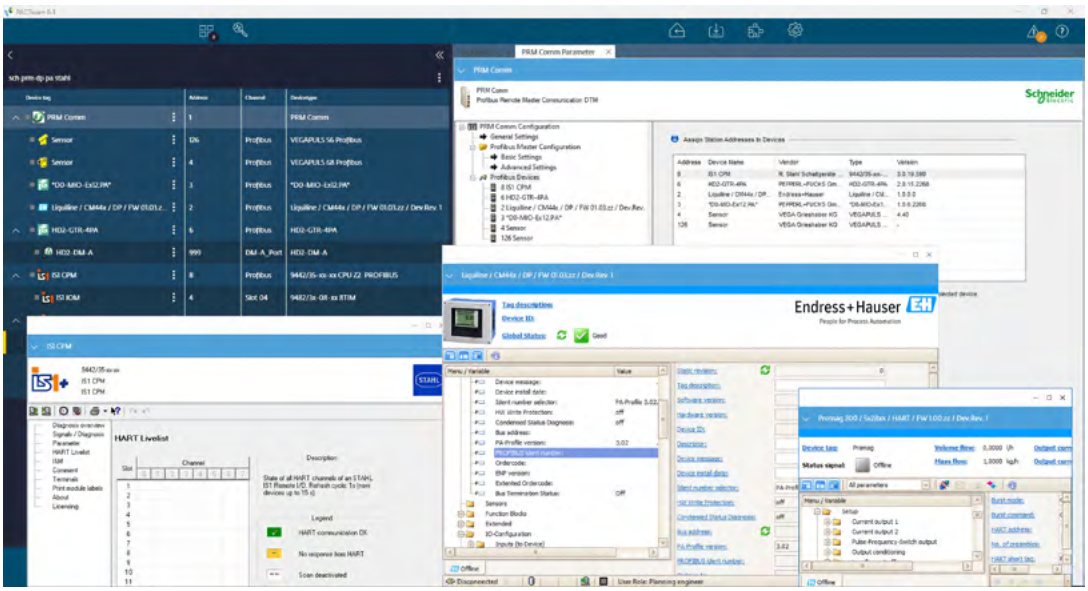


Figure 12: Schneider´s PRM (Profibus Remote Master) working as a Class1/2 Master connected to a Stahl RIO system, which offers HART Gateway compatibility. Additionally, Profibus PA support is offered by P+F´S SK3 DP/PA Segment Coupler which also includes an Advanced Diagnostic Module for the PA network.

Profinet for PA

In the past decade, PROFIBUS DP has gradually been replaced by PROFINET-based networks. PROFINET offers superior integration with other networks thanks to its detailed proxy-based interface gateway description, which standardizes all connection requirements with other industrial networks. By using a PROFIBUS PA to PROFINET proxy, PROFIBUS DP networks can be seamlessly migrated to PROFINET, ensuring that PROFIBUS PA-based process networks are not left behind.

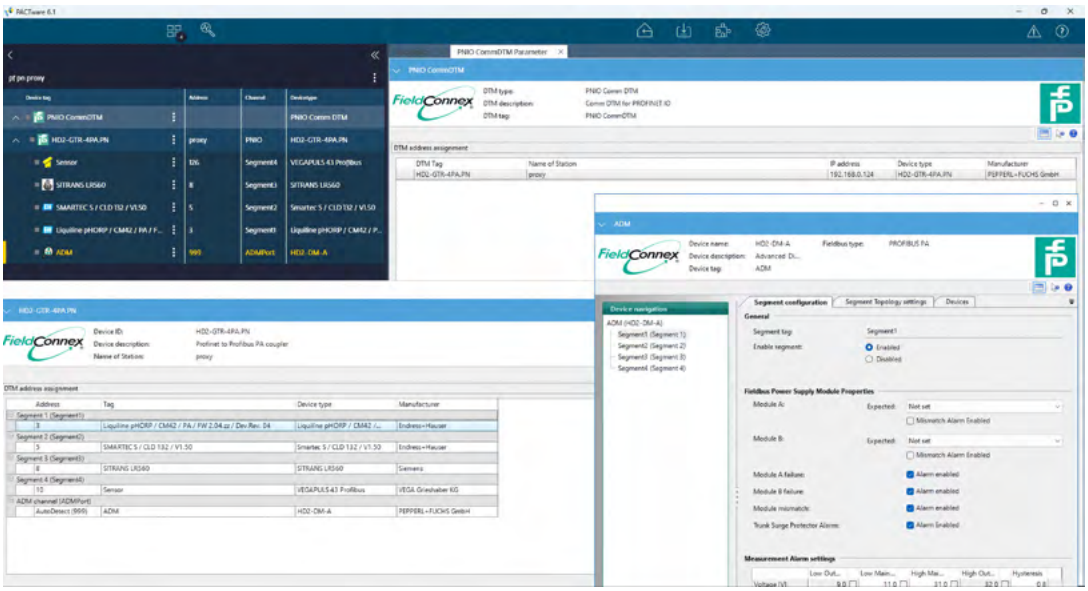


Figure 13: P+F´s Profinet proxy allows the integration of Profibus PA devices. The entire Profibus PA installation appears as a single Profinet IO device in the Profinet network.

Ethernet APL and the future

The latest innovation in Process Automation communications is Ethernet-APL (Advanced Physical Layer).

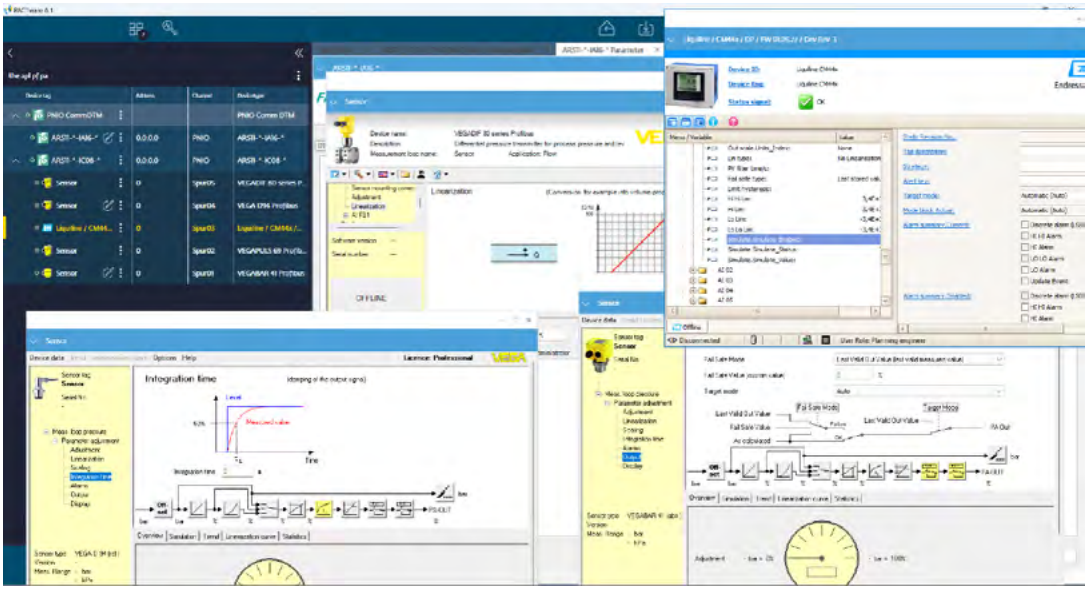


Figure 14: Ethernet-APL Field switches scan work as Profibus PA proxies for backward compatibility purposes

This technology, a subset of the SPE (Single Pair Ethernet) standard, enables Ethernet to reach the field device level using standard IEC 61158 cabling, which delivers both power and communications. It supports intrinsic safety through Ethernet-APL field switches that include physical layer diagnostics. Utilizing FDT/DTM technology, these field switches can also function as PROFINET PA proxies, allowing end users to perform a phased migration to the new technology.

From its inception, the FDT/DTM concept has continuously demonstrated adaptability, enabling innovations such as advanced diagnostics, nested networks, and fieldbus physical layer diagnostics. It has extended the life of HART technology by allowing RIO systems to function as HART gateways and has provided PROFIBUS connectivity to platforms not originally designed for it.

The FDT Group, now working in cooperation with FieldComm Group, embarks on a new era of developing innovative solutions to enhance field device integration into next-generation control systems.

CodeWrights

Interview with Sven Giesecke, Director Sales & Product Management at CodeWrights

In a compelling interview, Sven Giesecke and Steve Biegacki delve into the profound impact of FDT/DTM technology on the industrial automation community and highlight CodeWrights' solutions that support developers in achieving their goals.

Steve Biegacki
FDT Group Managing Director

Sven Giesecke
Director Sales & Product Management at CodeWrights

SB

Thanks for taking the time to talk about intelligent device management and integration strategies using FDT/DTM.

Please introduce CodeWrights, your mission, and the customer base you serve for the industrial automation market.

SG

CodeWrights develops customized software solutions for device manufacturers in the automation industry. With many years of experience, we support our customers in further developing their devices so that they can quickly adapt to the market's requirements.

We provide pre-developed, tested software modules as well as individual software services.

We have been actively involved in FDT since its beginning, helping system and device vendors fully leverage the benefits of FDT technology as an official FDT Service Provider.

SB

We are grateful to have CodeWrights as an essential FDT Service Provider to help the industry easily adopt and develop interoperable solutions using FDT technology.

As the industry grapples with demands for standardized device integration in a single device management tool, we are confident in CodeWrights' readiness to offer support. Could you elaborate on the specific challenges the community is facing, and how CodeWrights is prepared to address them?

SG

The FDT standard has been developed to provide a standardized interface for integrating field devices. These devices are sensors, actuators, or other instruments used to monitor and control processes in the industry.

When I speak with manufacturers, they regard FDT as one of the key technologies for interoperable configuration. But there are many other integration standards and technologies out there. One critical challenge is finding out which of these standards and respective device drivers are suitable for which use case. Do I, as a manufacturer, have to invest in and develop all of these, or are there other options and advantageous solutions?

This is where CodeWrights can help and advise—as we are involved in many, if not all, of these standards. Together, we can find out what is the best technology and standard for the current use case. Do we need an individual solution, or can we use existing solutions?

Our iDTM technology is a prime example of how we help our customers save costs. By efficiently combining existing device integration standards like FDI, EDD, and FDT/DTM, we significantly reduce development and maintenance efforts, leading to substantial cost reductions for our customers.

SB

CodeWrights' Interpreter DTM, the iDTM, is a great, cost-effective solution that provides investment protection for current installed base while promoting a unified environment for intelligent device management. We know the vendor and end-user communities enjoy this easy-to-use offering to streamline device management initiatives.

Why is the FDT/DTM standard (IEC 62453) important for device management?

SG

FDT was one of the first and is currently the most widespread standard for device asset management. All major system vendors and instrumentation suppliers support this standard. It helps users configure field devices from different manufacturers easily and efficiently within their asset management system and saves time and effort in maintenance training.

SB

It's great to see the positive impact FDT/DTM technology has provided for the industrial automation community focused on interoperability and intelligent device management independent of protocol, device type, or vendor.

CodeWrights has been an FDT Service Provider for more than 20 years. Tell us about your FDT development tools and services.

SG

We have been involved in the FDT developments from the beginning, starting in the Joint Interest Working Group. The goal has always been to create standardized interfaces that facilitate the development of clients and servers from multiple vendors that will interoperate seamlessly.

This is still the case, and much has been achieved. This is proven by the tens of millions of DTM drivers that support thousands of products that are used every day in the field. It started as Windows-based technology, but we have mobile and operating system-independent solutions since FDT 3.0, incorporating many new interfaces and standards, such as OPC UA.

CodeWrights helps its customers create the best possible solution for their needs. Our predeveloped components can significantly improve the time to market for these products.

SB

It's been a journey that has been supported by the industrial community for years. We are grateful to the user and vendor community for their support of the technology.

We are eager to learn about the advantages your vendors have gained from FDT-enabled device solutions and how it has translated into benefits for the user community.

SG

FDT/DTM and, thus, the supported device is integrated into multiple engineering tools from various vendors without additional effort. Users, whether chemical plant maintenance technicians or support engineers, can rely on a similar user interface. They don't have to install or learn how to use additional software, which makes it a lot easier.

The vendors will get the best integration solutions for their devices, allowing them to interface with as many host- and asset-management systems as possible.

case study

FDT/DTM Development – One Platform all Device Types Using Any Bus

M&M Software offers a FDT Development Suite catering to the evolving needs of the industry

In the field of device integration in the process automation industry, FDT (Field Device Tool) is the most widely used international standard (IEC 62453) and the Chinese national standard (GB/T 29618).

FDT can support any device on any bus from any manufacturer and can support a variety of applications, such as configuration, diagnostics, condition monitoring, and data acquisition, in one platform.

The FDT standard has evolved over time, with three major versions: 1.2.x, 2.x, and the latest 3.0. FDT 1.2.x, introduced in 2001, and FDT 2.x, launched in 2012, were designed for Windows. However, the most recent FDT 3.0, unveiled in 2020, is a cross-platform solution, catering to the evolving needs of the industry.

In the FDT system, the upper computer software, known as Frame Application, acts as the interface between the user and the device. On the other hand, the device driver, called DTM (Device Type Manager), enables the device to communicate and control itself.

A DTM can only select one specific FDT version, while the framework can support multiple FDT versions of the DTM.

The DTM provides rich device configuration and diagnostic functions through a unified style graphical interface and can effectively reduce the training cost of equipment maintenance personnel.

DTMs can be categorized into Communication DTMs, Gateway DTMs, and Device DTMs. Where a device DTM is the FDT driver of an intelligent field device (instrument or actuator), a communication DTM is the FDT driver of a communication device (e.g., a DCS master controller, a bus communication card, or a HART Modem), and all other intelligent devices (e.g., a Remote IO.) between the communication device and the smart field device are called gateway DTMs, HART Multiplexer) FDT drivers are called Gateway DTMs.

DTM Development Program

In the FDT system, the management of and access to intelligent field devices is achieved by means of DTMs. DTMs are generally developed by the equipment provider, and the optional technical solutions are described in the following section one by one.

dtmMANAGER is a DTM development suite provided by M&M Software, which provides a complete DTM development toolchain to automatically generate a runnable base DTM through graphical wizards without the need for FDT domain knowledge.

Equipment providers developing their own DTMs use dtmMANAGER as the most used tool for DTM development.

Applicable Scenarios:

- Development of communication DTMs for DCS master controllers, gateway DTMs for IO modules and multiplexing
- Equipment providers have a large number of device types and need to support multiple fieldbuses
- Device types with more complex functions and views (e.g. advanced diagnostics for valves, controller configuration, comparative analysis of historical curves, etc.) that want to customize the DTM in depth to take full advantage of the capabilities of the smart device

Advantage:

- The business logic and user interface of the DTM can be customized at will.
- Full control over domain knowledge and DTM source code
- Support for FDT 1.2.x, FDT 2.x and FDT 3.0

Cost:

- M&M Software dtmMANAGER Licence
- Annual Maintenance of M&M Software dtmMANAGER
- dtmMANAGER Training Workshop
- Labor costs for DTM development teams to develop DTMs

Deliverables:

- M&M Software dtmMANAGER Standard Products
  - Installation package
  - Development Tutorial Documentation
  - dtmMANAGER source code
  - Sample DTM Source Code
  - Annual technical support services
  - Training Workshop

GenericDTM is a general-purpose DTM product of M&M Software, which realizes the basic access capability to all intelligent devices of a specific bus, such as process values, device status, measured value quality, etc., based on the common commands of the fieldbus and the device line rules.

Applicable Scenarios:

- Device type does not provide additional owned parameters
- Need to quickly provide DTMs for one or more device types at the lowest cost to meet project requirements
- Provide basic access to smart devices as a transitional solution until formal complex DTM development is complete

Advantage:

- All HART devices are supported, Profibus PA devices will be supported soon.
- No additional driver information is required for the device
- Efficient acquisition of equipment status and primary and secondary process values
- Low cost
- Short lead times

Cost:

Choose between Device Type Licensing and Device Provider OEM Licensing:

- M&M Software genericDTM device type license, available only for the licensed device type, charged per device type quantity
- M&M Software genericDTM device provider OEM license, supports all device types of the licensed device provider, provides OEM version of the DTM installation package

Deliverables:

Based on the choice of the type of authorization:

- M&M Software genericDTM binary installer + device type license file
- genericDTM OEM Edition Binary Installer

fdiDTM is M&M Software's Interpreter DTM product that encapsulates a device's DD/FDI files into a DTM for integration into the FDT framework, while providing a graphical interface and API-based data access capabilities.

Applicable Scenarios:

- Integration of DD/FDI technology into FDT systems
- Low-cost, fast DTM for device types with DDs

Advantage:

- Support for DD parameters
- Supports access to parameters via graphical interface and APIs
- Support for HART, FF, PROFIBUS and PROFINET
- Support for FDT 2.x and FDT 3.0

Cost:

Choose between Device Type License, Device Provider OEM License and System Provider OEM License:

- M&M Software fdiDTM device type authorization, available only for the authorized device type, charged per device type number
- M&M Software fdiDTM device provider OEM license, supports all device types of the licensed device provider, provides OEM version of the DTM installation package
- M&M Software fdiDTM system provider OEM license, support any device type, provide OEM version of the DTM installation package

Deliverables:

Based on the choice of the type of authorization:

- M&M Software fdiDTM binary installer + device type license file
- fdiDTM OEM Edition Binary Installer + Device Provider License File
- fdiDTM OEM Edition Binary Installer + System Provider License File

dslDTM introduces DSL (Domain Specific Language) technology, which describes in textual form how each parameter of the device is read and written, as well as how the parameters are organized and presented in the user interface, to significantly reduce the development costs of DTM.

Applicable Scenarios:

- Need for low-cost, fast DTMs for a larger number of device types
- Complex functions such as advanced diagnostics need to be supported through secondary development beyond parameter access.

Advantage:

- Supports any device and any bus
- Parametric access can be supported inexpensively and quickly
- Provide source code and support advanced functionality through secondary development
- Supports FDT 2.x and FDT 3.0

Cost:

- M&M Software dslDTM Licence
- M&M Software dslDTM Annual Maintenance
- dslDTM Training Workshop
- Labor costs for DTM development teams to write DSLs and secondary development of advanced features

Deliverables:

- M&M Software dslDTM standard products
  - Installer
  - Development Tutorial Documentation
  - dslDTM source code
  - Example Device DSL Source Code
  - Sample secondary development of advanced functionality source code
  - Annual technical support services
  - Training Workshop

basicDTM is a standard service provided by M&M Software to translate DD source code into DTM code.

Applicable Scenarios:

- Smart devices already have DD
- Equipment providers need to deliver DTMs in a very short period of time

Advantage:

- Short delivery times
- Support for DD parameters
- Support DD method
- Customization can be added in addition to DD

Cost:

- M&M Software dtmMANAGER Single Project License
- M&M Software basicDTM Single Project License

Deliverables:

- DTM Binary installation package
- DTM Binary Installer

Customized Development of M&M Software DTM

In addition to the products, M&M Software also provides custom DTM development services, helping customers that choose to outsource their DTM based developed based on M&M Software's products mentioned above.

Applicable Scenarios:

- Lack of on-board software developers or insufficient manpower to complete DTM development by the specified delivery date
- Device types with very complex functionality or large technical challenges in DTM development

Advantage:

- Rapid implementation of complex functionality without the need for a large development team
- DTM quality can be guaranteed, and you can be sure to pass the official DTM certification test of the FDT organization.
- Support for FDT 1.2.x, FDT 2.x and FDT 3.0

Cost:

- Product-specific licenses for M&M Software
- DTM development costs

Deliverables:

- Standard deliverables for specific products from M&M
- DTM Binary Installer
- DTM Source Code

FDT Version Selection

A DTM can only support one specific FDT version. A brief comparison of the FDT versions and recommendations for selection are described in the charts below.

Comparison of Features of FDT Versions

The table below briefly compares the differences between the FDT versions.

COMPARISON TERM	FDT 1.2.	FDT 2.X	FDT 3.0
INTERFACE DEFINITION	COM	.NET Framework	.NET Standard
DATA DEFINITION	XML	.NET Framework	.NET Standard
USER	ActiveX	WPF/WinForms	HTML5
DEVELOPMENT LANGUAGE	C++	C#	C#
OPERATING SYSTEM	Windows	Windows	Windows/Linux/MacOS
CPU	x86	x86	x86/ARM/LonngArch

It is important to note that the FDT Group requires that the development of software based on FDT 3.0 technology be preceded by the signing of the FDT Standard Collaboration Agreement. Please get in touch with FDT China for a copy of the agreement.

Recommendations for FDT Version Selection

The following table briefly lists the factors that influence the choice of FDT version, with ■ indicating recommended, □ indicating optional, and **X** indicating not supported.

INFLUENCE FACTORS	1.2	1.2.1	2.0	2.1	3.0
FDT framework only supports FDT 1.2.x	■	□	X	X	X
FDT framework supports FDT 1.2.x/2.x	□	□	□	■	X
FDT framework supports FDT 1.2.x/2.x/3.0	□	□	□	□	■
FDT framework only supports FDT 3.0	X	X	X	X	■
DTM needs to support cross-platform	X	X	X	X	■
DTM needs to support mobile access	X	X	X	X	■
DTM needs to support data access via API	X	X	□	■	■
DTM needs to support data access via OPC UA	X	X	□	■	■
DTM needs to support upgrade to FDT 3.0	X	X	□	■	N/A
DTM needs to pass certification tests	■	□	■	□	■
DTM requires low development and maintenance cost	X	X	□	□	■
DTM requires fewer incompatibilities with frameworks	X	X	■	■	■
Unable to sign SCA	□	□	□	■	X

For more information, please visit: www.mm-software.cn

case study

VEGA Expands Radar Portfolio for Factory Automation

Introducing VEGAPULS 42: A High-Performance Sensor with User-Friendly Design

VEGAPULS 42 brings VEGA's decades of radar experience to factory automation. The sensor meets the industry's unique requirements for levels in small tanks or clocked filling processes. It is equipped with everything hygiene-sensitive processes need—its switching frequency enables high cycle rates and correspondingly fast level changes. Its flexible connection options range from standard threads to the universal connection for its 1-inch hygienic adapter. It is immediately ready for operation and communication with IO-Link in the 3-wire version when delivered.

Radar, as a non-contact measuring principle, offers significant advantages in clocked processes in the food and pharmaceutical industries, such as filling. These advantages, which other measuring solutions cannot provide, are crucial. In an era where reliable measured values are essential to efficient plant operation and optimal process control, the need for such a solution is paramount.

VEGAPULS 42 is not just a powerful sensor but also a user-friendly solution. It communicates universally with IO-Link and can easily connect via a simple 3-wire connection, ensuring quick and cost-effective installation. Sensor replacement is automated with the new Smart Sensor Profile 2, and adjustment is a breeze with PACTware (FDT) & VEGA DTMs or the VEGA Tools app on a smartphone with Bluetooth.

With VEGAPULS 42, an illuminated ring that changes color allows the sensor to be viewed from all directions and even from a distance. This configuration gives you immediate certainty about the sensor's current condition and another way to check the process status.

With over 60 years of user partnerships in process automation, VEGA has built extensive know-how for solving the most demanding measurement tasks. Transferring this knowledge to factory automation offers customers a comprehensive range of compact level and pressure sensors with IO-Link.

For more information, please click here.

Rockwell Automation

Discover our next generation *HART-enabled* universal I/O **& make it a part of your process application**

Lower design and commissioning cost with universal I/O.

Contact your local Rockwell Automation sales representative or Allen-Bradley distributor for more information.

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