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FDT® GROUP

Real-Time Data

Harmonizing Industrial Device Management

Let's Harmonize Intelligent Device Management

Standards collaborating for the good of the industry

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For several decades, the industrial world has been blessed with a plethora of internationally accepted open standards that have simplified the plug-and-play environment of engineering systems and smart devices. These standards have unlocked system solutions restructuring processes, improving industry safety, efficiency, and profitability.

Today, users find new challenges related to interoperability and data exchange of networked infrastructures using different vendors, systems, service tools, device types, data models, communication protocols, etc., that should seamlessly integrate enterprise wide. Currently, you can still find system and device solutions that aren't supporting open integration and device management methods leading to complexities of multiple device management environments and service tools creating inefficiencies and silos of critical field-level data needed for innovation.

With the networking of industrial protocols, the market seeks to innovate via holistic business models focused on connecting and viewing 'things' in unity. The FDT Group manages an IEC 62453 standard dedicated to harmonizing industrial standards establishing a universal approach for intelligent device management and IT/OT data-driven operations. Whether an end user wants to leverage a point-to-point or distributed control environment, run a multi-vendor multi-network (process and/or discrete) topology, prefers a web-based configuration tool, desires enterprise data access, or is running device drivers like DTM's, (E)DD's, FDI packets, IODD files, etc., FDT enables users the freedom to select equipment and tools that best fits their application while providing the unified environment for device management, data exchange and monitoring.

By reducing complexity focused on device integration and lifecycle management, FDT helps users realize operational excellence by improving performance, lowering maintenance costs, reducing downtown, enhancing operability, and saving money. **Users around the globe recognize the value of FDT** by specifying FDT DTM for system and device solutions during the bidding process. The industry currently deploys tens of millions of FDT device DTMs serviced by FDT-enabled engineering applications (ie; PACTware, *fdtCONTAINER*, Asset Management Applications, DCSs, PLCs, etc.) globally.

Thanks to collaborations with other standards organizations, FDT is positioned uniquely; as the key to comprehensive interoperability, device configuration/management and data access enterprise wide.

- FDT's twenty-year legacy supports over 17 protocols and platforms — CANopen, CC-Link, CompoNet, ControlNet, DeviceNet, EtherCAT, EtherNet/IP, FDI, FOUNDATION fieldbus, HART, WirelessHART, ISA100Wireless, Interbus, IO-Link, Modbus, OPC UA, ProfiBus, ProfiNet, Sercos and proprietary protocols.
- Over the last year, FDT Group has engaged with the OPAF organization to provide a method to connect and manage process sensors and actuators of an OPAF system.
- We are collaborating with OPC Foundation, ODVA, and FieldComm Group to harmonize intelligent device configuration and management.
- Recently, the FDT Group became the ninth owner of the PA-DIM specification. Supporting PA-DIM acknowledges the good work done with the spec, while being able to promote and enhance that specification for process devices.
- For all devices, FDT Group is working closely with OPC UA FX on the C2C and C2D specification, which will ultimately provide a standard approach to configure both process and discrete devices.

We have made good progress – one of increasing our collaborations – with the goal of intelligent device management harmonization, making life as a plant manager a little easier.

Looking ahead, the FDT Group will work with regional industry associations to host User Forums to gather feedback on current and future control system device management needs and complexities. The valuable feedback will facilitate FDT's evolutionary journey committed to empowering the intelligent enterprise. Watch the fdtgroup.org website for upcoming user forum events in your area.

NEWSROOM

FDT GROUP INTRODUCES FDT UE DEVELOPER TOOL EVALUATION SOFTWARE

NEW ROCKWELL AUTOMATION AND ENDRESS+HAUSER LEADERS APPOINTED TO THE FDT BOARD OF DIRECTORS

M&M SOFTWARE ANNOUNCES RELEASE OF FDTCONTAINER AND DEVELOPER TOOLS SUPPORTING FDT 3.0

Steve Biegacki explains why FDT is an important standard and introduces FDT (3.0) UE for intelligent device management within IIoT applications empowering IT/OT data-driven operations.

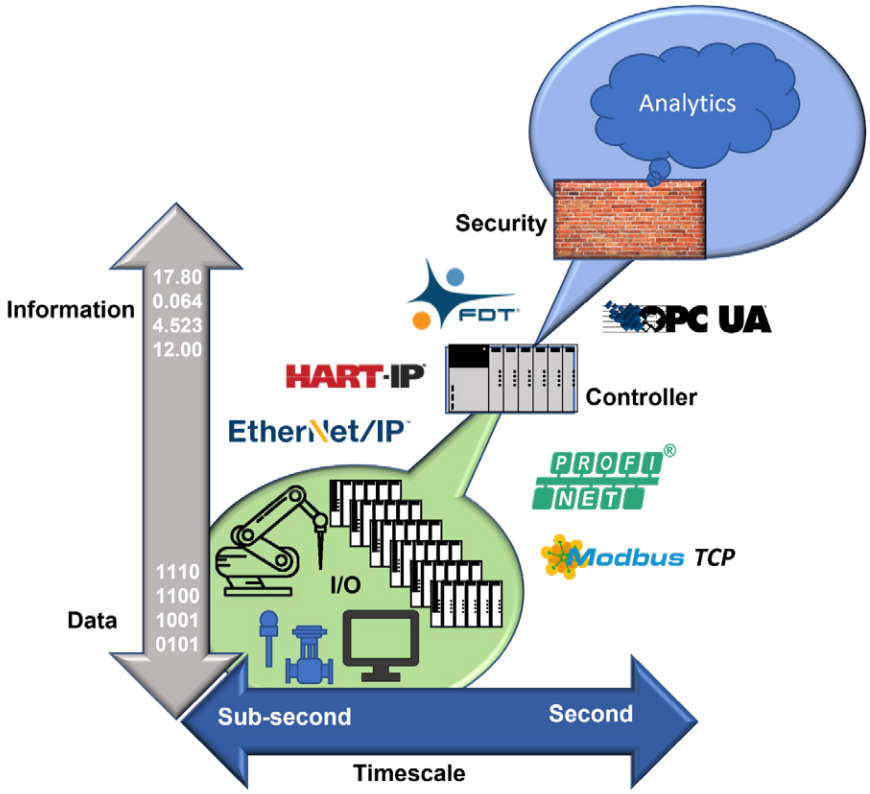
Suriya Selvaraj, VP of FDT Technology explains why Yokogawa's asset management solution uses FDT for configuration, commissioning and monitoring of all connected devices enabling operational efficiency, safety, quality and reliability.

MODERNIZING AND UNIFYING

Unified Environment for Control System Integration

Common use of open standards lay the foundation for interoperability

In the last decade, the use of open standards has become a requirement for the adoption of new technologies by the automation industry.



Use of open standards in industrial automation applications

"Open Standards" are standards made available to the public and are developed (or approved) and maintained via a collaborative and consensus-driven process.

This process usually is managed by the corresponding Standards Development Organizations or SDO, which generally are non-profit entities whose purpose is to maintain and improve the standard through its lifecycle.

"Open Standards" are meant to facilitate the interoperability and data exchange among different products or services and are intended for widespread adoption.

The term "open standards" used to be linked with software development, but today it implies the concept of hybrid interconnected platforms that include both software and hardware.

Background history

This concept was a consequence of a discovery made by companies and end users: the adoption of a unified environment was more efficient than repetitive and/or incompatible software asset developments. The most notable proof of success of this approach is the Internet.

It may be difficult to understand how disruptive the open standards concept was in the 70s. The idea looks counterintuitive initially because it implies sharing R&D data with your competitors.

But when you reach levels of economy of scale, in any specific market there are limits to the market share that a single specific, proprietary, and closed technology can reach.

Open protocols, integration standards, technology, and an example

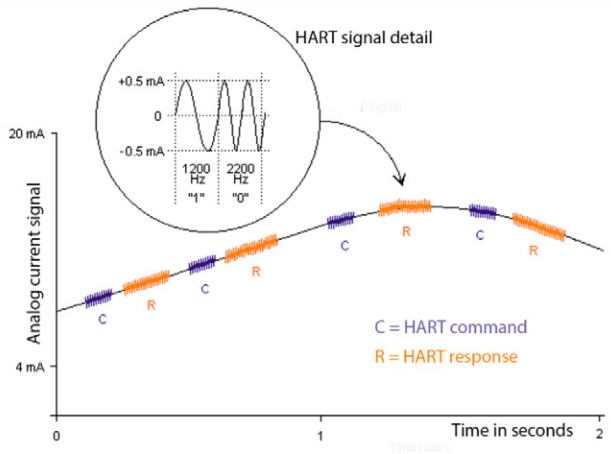
The Open Standards approach started to appeal industrial automation suppliers and users in the late 80s.

We can get a better understanding of the adoption process for this approach by reviewing a particular example:

One successful example of implementation of open standards can be seen in the combined use of HART, OPC and FDT/DTM technologies. These technologies differ vastly between each other, but thanks to the use of open standards they can work seamlessly together.

HART

The HART protocol was a Fisher Rosemount's development employed in the first generation of Smart field devices, based on the use of Bell's Frequency Shift Key (FSK) encoding technology.



The FSK encoding method employed in HART.

Afterwards, every competitor presented its own smart field devices using FSK technology variants. Traditionally, the outcome of such a situation was a fierce competition among suppliers that created a fragmented market without interoperability support.

The innovative path adopted by Fisher Rosemount avoided this outcome. The company chose to release HART technology to the public by means of an SDO called the HART Foundation, a non-profit entity that would be responsible for the maintenance, diffusion, and development of HART Technology. Any manufacturer interested in HART smart field devices could become a member of the Foundation and get access to the specifications and the certification process for its devices through the compliance tests of the Hart Foundation.

Today, HART is the most used communications protocol for smart field devices in process applications worldwide.

IT/OT integration in Industrial Networking

In the last 10 years, the digitalization of industrial processes has received a significant push to converge the two kinds of networks used in automation applications: IT (Information Technology) and OT (Operation Technology) networks.

Level	Mission and purpose	Systems involved
4	**Business planning**	ERP, WM, EDS
3	**Operations Management**	Production, scheduling, OM maintenance, remote access
2	**Supervisory Control Applications**	SCADA, DCS, HMI ICS
1	**Process Control Network**	PCN, SIS
0	**Physical Production Process**	Sensors, actuators, wiring and field devices

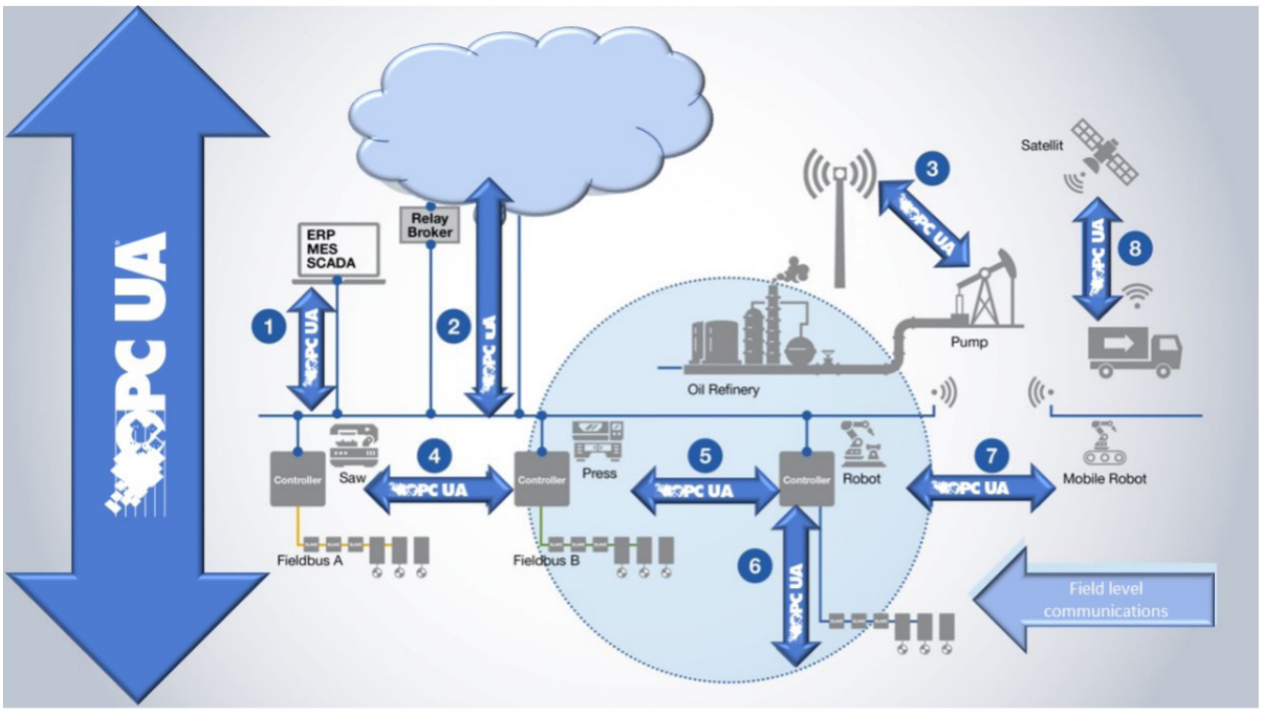
IT
OT
Ethernet

Theoretical model of IT/OT integration, according the ISA95 standard

IT technology used open standards from its early origins including the use of Ethernet networks, while OT technology origins were based on proprietary serial RS-485 networks.

Early attempts to link both kinds of networks used interfaces (a.k.a. gateways) that linked their physical layers and performed protocol translations.

Protocol translations limit the transparent exchange of data and physical layer characteristics created data transfer speed rate limits which caused bottlenecks.



OPC UA; the industrial communications backbone

OPC UA

The software layer that enables IT/OT integration is the OPC UA standard. OPC has a long and complex evolution story. Starting as a Microsoft-specific technology called OLE (Object Linking and Embedding), created as an enhanced replacement to DDE (Dynamic Data Exchange), the first attempt allowed data to be exchanged between applications in a Windows environment.

OLE allowed the operating systems (OS) different types of automatic data exchange between applications and used object-oriented programming, a great improvement back then.

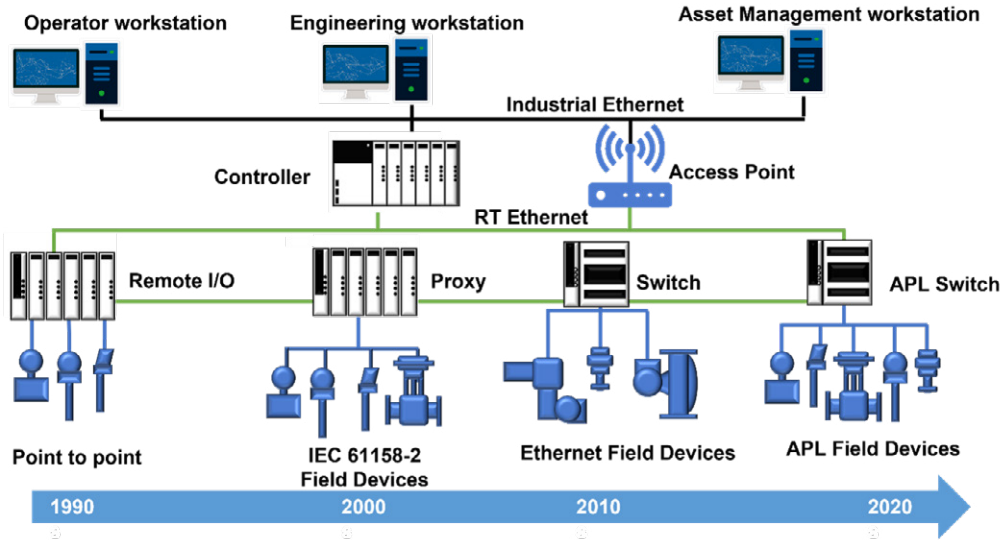
OLE used a technology called COM (Common Object Model) to allow the creation of reusable code objects. It was superseded by DCOM technology, which added networking support functionality.

The use of DCOM across Windows based automation platforms created several problems: it required a common DCOM version installed in all the network nodes, but software patching and upgrading made this difficult. DCOM has been, largely, replaced by .NET technology which uses the Windows Communication Foundation platform compatible with Web based services.

An automation taskforce developed a version of OLE optimized for process control applications, known as OLE for Process Control. Later it was renamed as OPC (Open Platform Communications) to signal that the technology had evolved away from its IT origins. OPC was created to allow real time data exchange in plant level applications across various control systems from different suppliers.

The OPC Foundation made OPC independent of DCOM technology, by creating a platform-agnostic version of OPC called OPC UA (Unified Architecture), a middleware solution that allows data exchange in real time across different control systems with independence of the OS being used.

OPC UA offers advantages over OPC and has become the default software backbone for networked industrial automation applications.



The road to Ethernet to the field

Industrial Ethernet and Ethernet-APL

The hardware side of IT/OT integration is used Ethernet technology. Initially deemed inadequate for industrial applications, later developments made possible the use of Industrial Ethernet in industrial environments.

In fact, for many years, Ethernet was also not adequate for field use. With the experience gained in the fieldbus era, Ethernet-APL (Advanced Physical Layer) was developed and the workgroup rescued the best elements of fieldbus, such as explosion protection concepts and the robust Type A cable.

Unlike IEC 61158 fieldbuses, Ethernet-APL is not a communication protocol, it is a new physical layer for Ethernet connectivity to the field. Therefore, end users can keep their existing Industrial Ethernet implementations.

A consequence of digitalization is that every device connected to the network becomes a node that can exchange data bidirectionally with the upper hierarchy levels. Since every node can exchange large amounts of data through a single connection, there is no physical difference in the connection of a single variable device and a multivariable one.

If every device becomes multivariable in an Ethernet network, then the need of a software-based method for its system integration appears.

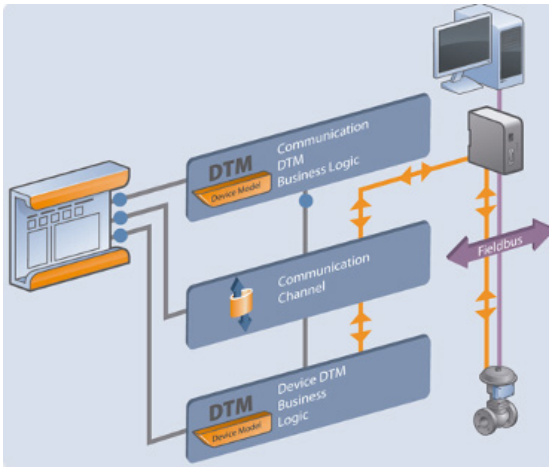
FDT/DTM

Initially smart devices employed text-based device description files for this task. Newer, more complex devices require a more advanced device descriptor. A software-based approach works better, allowing easy integration of the full set of features and functions of the smart device.

FDT/DTM (technology (IEC 62453)), is an intelligent device and lifecycle management standard that provides a single interface to all connected assets in a multi-vendor, multi-protocol environment. The solution is a key enabler for asset management and data-driven operations.

Presented in 2001, when FDT Version 1.2 was made available, the FDT/DTM concept's objective was to provide end users of smart devices with a single, user-friendly configuration tool compatible with Windows PCs.

In FDT, device descriptors are software-based components, known as DTMs, which run within an FDT-enabled engineering application allowing the connection of smart devices in a unified environment.



Logic structure of an FDT-DTM application

FDT/DTM works like an abstraction layer hiding protocol conversion procedures, which are performed by communication DTMs for gateways employed to connect smart devices to FDT-enabled host applications.

A worldwide standard harmonizing system integration

FDT has been widely adopted as the key integration standard streamlining intelligent device management for users today. Tens of millions of DTMs are deployed and serviced by FDT-enabled hosting applications every day all around the globe. The solution is pivotal for increased plant performance for sustained lower operating costs.

The hosting application allows end users to configure devices utilizing a single interface, compared to other technologies that use proprietary software tools to operate and configure devices. This reduces the need for capital and training investment in additional hardware and software.

For example, a current install base of smart instrumentation can benefit from FDT technology by using the Desktop application to configure all the devices on the network from the cozy chair in the control room or any other remote location. Once complete, the user will have central diagnostics, predictive maintenance, and process optimization for all devices in the facility, allowing the user to access devices in real time over the life cycle (engineering, installation, commissioning, production, and maintenance) of the plant.

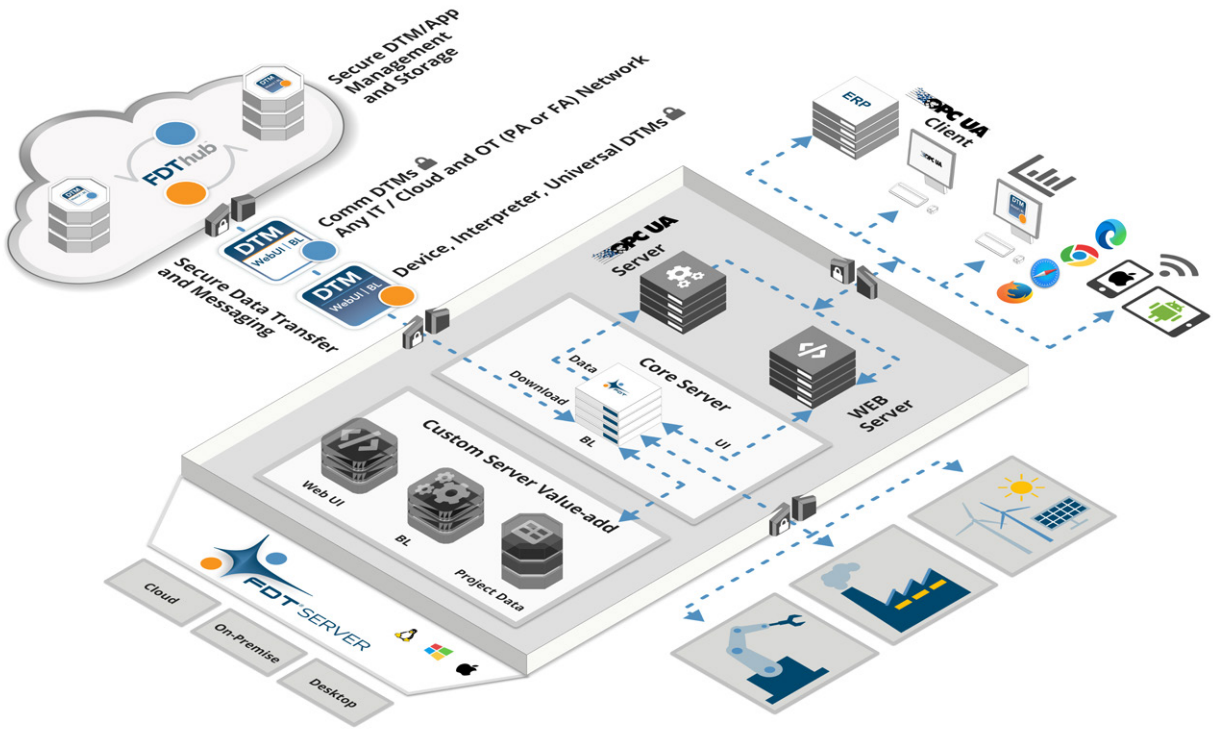
An evolving modular design fit for every need

FDT technology has a flexible modular design, so the technology can be implemented as a stand-alone application, integrated into the control system or the asset management software solutions of any supplier.

FDT DTM technology makes it possible to perform the remote asset management of any smart field device, independent of the communication protocols and vendor equipment used.

In 2012, FDT version 2.0 was made available, adding client/server functionality for networked environments and OPC UA support to its Desktop engineering application.

In 2020, FDT version 3.0, also known as the FDT Unified Environment (FDT UE) was released offering extensions inclusive of an agnostic operating platform (macOS, Linux, Microsoft), IT/OT data interoperability with OPC UA and Web Services mobilizing field device management. It can work with cloud-based applications and incorporates cybersecurity, mobility, and allows for data interoperability and access across the enterprise using new web-based DTMs.



The architecture of FDT (3.0) UE

FDT UE hosting applications include a stand-alone desktop application and the new Server application (also an OPC UA and web server) that offer the embeddable, modular, network oriented, web-based environment delivering services and client-based device management and data-driven operations throughout the architecture hierarchy.

Scalability and future proof

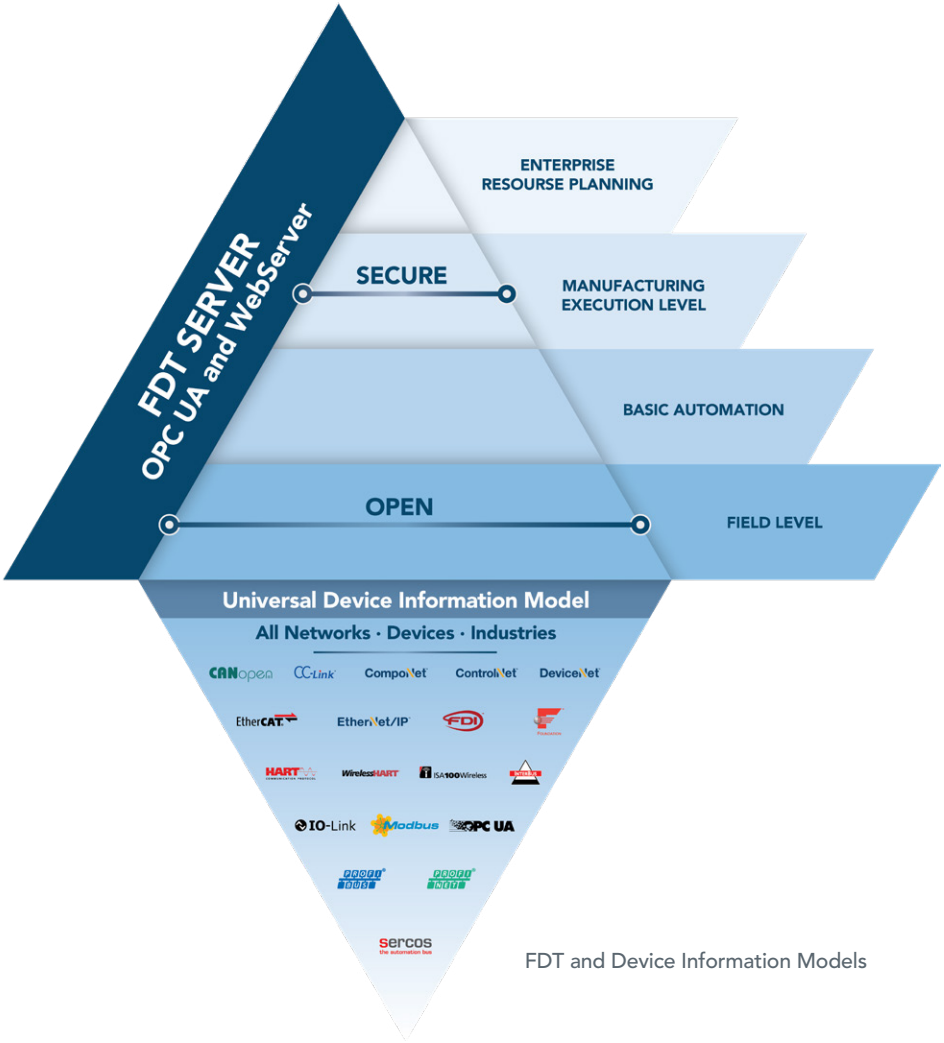
As field devices become smarter, featuring more complex parameterization, and become pervasive in plants, device setup and commissioning become difficult work for human operation. Newer plant requirements like predictive/ proactive maintenance, real time diagnostics, and maintenance + optimization systems, in accordance with the NAMUR NOA specification (NAMUR Open Architecture) further increase that workload.

New generations of automation control systems based on Open Standards (OPAF and OPAS) are being designed with the idea of automating the commissioning process via software solutions, a procedure known as orchestration.

The growing importance of information models

During orchestration, the control system must be able to correctly identify, configure and commission any device connected to the network, without being affected by problems such as ambiguous device naming. The solution for this requirement is the use of a standardized device information model, with a hierarchical structure and with the incorporation of semantics support to establish the correct association between device features and protocol parameters, thus enabling the ability to "map" protocol specific parameters to globally standardized terms for these parameters.

PA-DIM (Process Automation-Device Information Model) technology is the most likely device information model to be employed for this purpose. Since both PA-DIM and FDT UE are based on OPC UA, the implementation of this device information model-based commissioning is simplified.



FDT and Device Information Models

How do these three stories blend into one?

In 2007, the HART Foundation presented HART-IP, a new implementation of the HART protocol ported over Ethernet, fundamentally eliminating the main critique to the technology, its data transfer rate.

In 2022, The Ethernet-APL team (formed by the ODVA, OPC Foundation, PI Organization, and the FieldComm Group) presented Ethernet-APL, a new advanced physical layer for Ethernet that enabled it to reach the field. Ethernet-APL can be used for HART-IP devices.

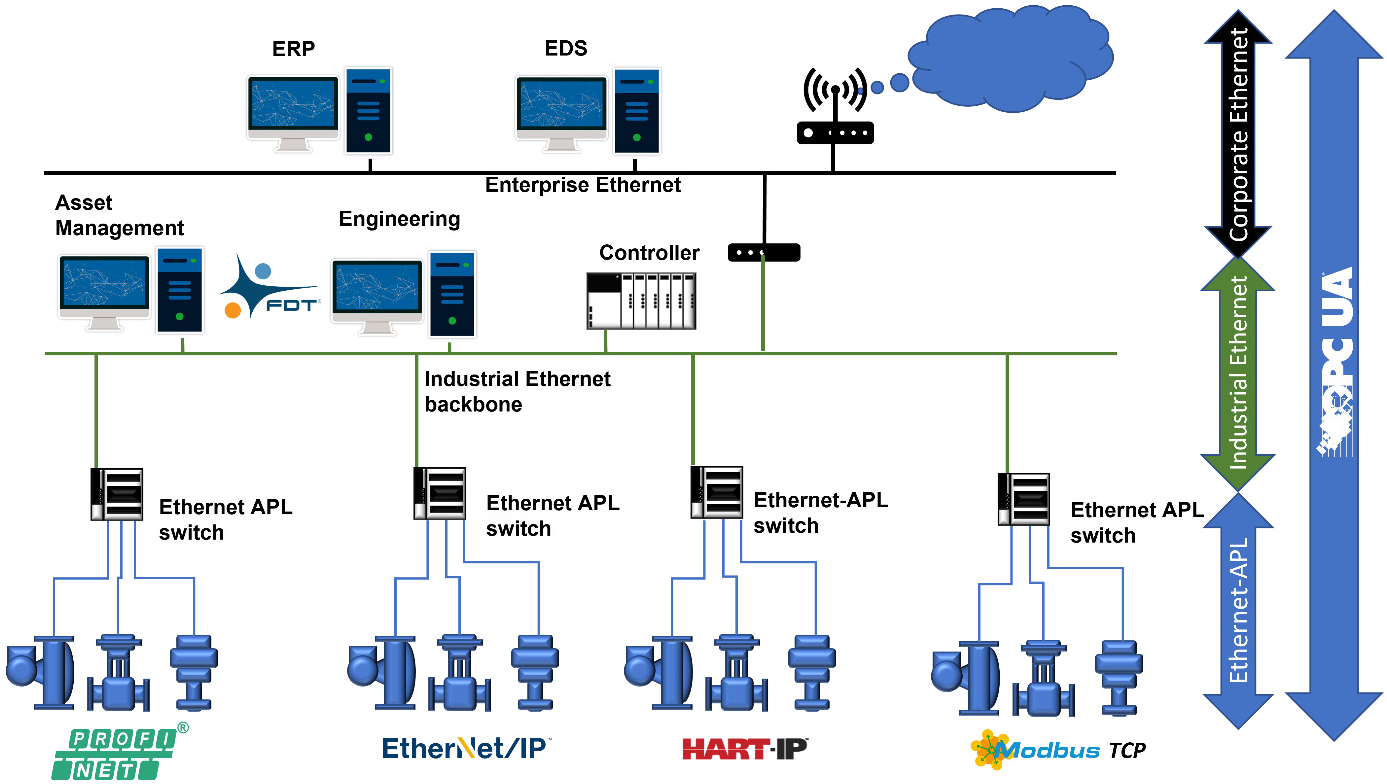
In 2020, the FDT Group announced the availability of the FDT (3.0) UE (Unified Environment), making FDT the harmonizing standard open to all vendors, networks, devices, information models and industries for intelligent device configuration, management, and data exchange across the enterprise.

Conclusions

By analyzing this integration example, we have seen how three different technologies, one hardware based (HART), other software-based applications (OPC UA and FDT UE) and a communications protocol (Industrial Ethernet) can interact together and provide a unified environment for system integration.

An advantage of the open standards approach is that it can work either for Process Automation applications, like the integration example we have just analyzed, or for factory automation applications. FDT UE offers the same functionality when it is employed with factory-oriented industrial Ethernet protocols like Modbus TCP, EtherNet/IP or Profinet. The workflow using these different protocols is the same but with FDT DTMs corresponding to VFDs, motor starters and discrete sensor networks.

And all this integration is made possible by the common use of open standards as the underlaying foundation.



Open Standards interoperability across the enterprise

case study

Meet M&M Software's Full Developer Stack Now Supporting FDT UE

Strengthen Integration of Automation Components with FDT/DTM

As one of the earliest service partners of the FDT Group, M&M Software has continuously updated its FDT product and development line contributing interoperability and harmonized device management success for industry customers worldwide.

M&M Software now offers full-stack development solutions supporting the latest FDT 3.0 standard for enterprise-wide integration via the Unified Environment (UE). The updated developer tools enable modern point-to-point configuration environments along with embedded system solutions for distributed control and web-based device DTM solutions.

Meet the M&M Software development ecosystem:

The **fdtCONTAINER** component (aka. Desktop Common Component) v4.0 supports FDT 3.0 DTMs and interoperability with FDT 1.2.x and FDT 2.x DTMs. Desktop/Frame applications based on version 3.x (even v2.x) can migrate to FDT3 easily with the help of the Migration Guide document.

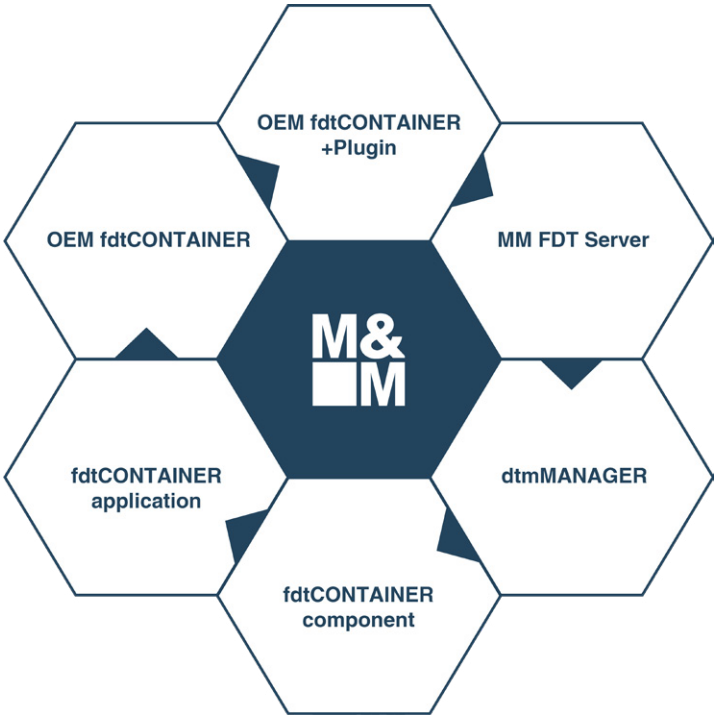
OEM fdtCONTAINER is also FDT3-ready. Your custom branded FDT UE Desktop solution could be ready within a few weeks. Customers with valid licenses can get the new FDT UE version freely. Just contact us.

OEM fdtCONTAINER can be extended to support custom features with a new *Plugin* infrastructure. Imagine customizing your OEM solution with differentiating value-added features: synchronize topology from your DCS, project template, SCADA like topology view, batch device operations, etc…you're only limited by your imagination.

dtmMANAGER v4.0 comes with a new tool chain including a wizard to generate DTM source code solutions, an auto deployment tool, DTM packing and signing tool, as well as the common controls for the new DTM Web UI.

Need to manipulate FDT 1.2.x and FDT 2.x DTMs together with FDT 3.0 DTMs in a cross-platform FDT UE host? Interested in the new features of FDT UE but lacking FDT 3.0 DTMs? M&M Software can tackle your interoperability challenges…we have a solution for you!

We look forward to your inquiry:
fdt@mm-software.com



case study

A More Reliable Level Measurement for Industry 4.0

VEGAPULS 6X is one of the first level sensors developed with IEC 62443-4-2 cybersecurity standards in mind.

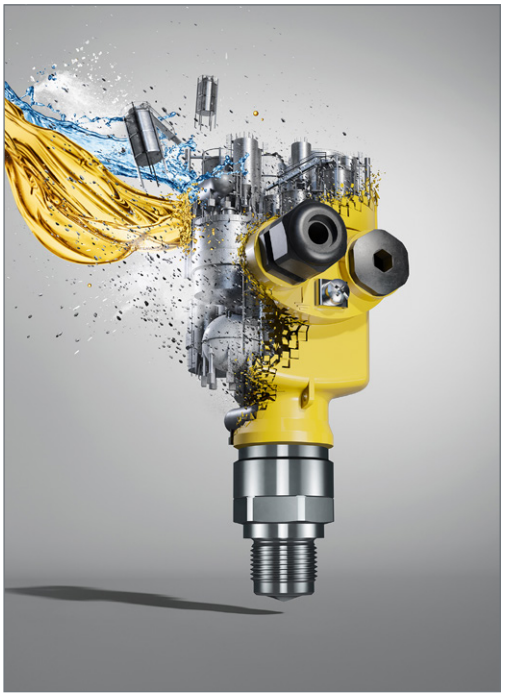
The process industry is evolving. Digital connectivity is forging rapidly ahead as concepts and technologies such as NOA (NAMUR Open Architecture), MTP (Modular Type Package), and Ethernet-APL (Advanced Physical Layer) are deployed in an increasing number of processes around the world. This opens up new avenues into the previously self-contained automation level and thus a theoretical convenient entryway for cyberattacks.

In spite of potential vulnerabilities, the open-endedness provided by these technologies offer numerous advantages for users. For example, level sensors provide important data across many different areas of industrial activity.

Process data is thus available across locations, allowing for worldwide inventory management. For that reason, VEGA put great effort into achieving IEC 62443-4-2 certification for its latest flagship radar level sensor, VEGAPULS 6X.

The development of VEGAPULS 6X included an analysis of possible threats right from the start in order to identify weak points at an early stage and create countermeasures. This was to ensure not only the security of the sensor itself, but with the entire production process to which it would be connected. This work was supervised by the independent institution TÜV Nord, which ensured a robust and secure networking framework. All of this work culminated in VEGAPULS 6X emerging as the secure radar level sensor for the future of the process industry.

For more information about the VEGAPLUS 6X



case study

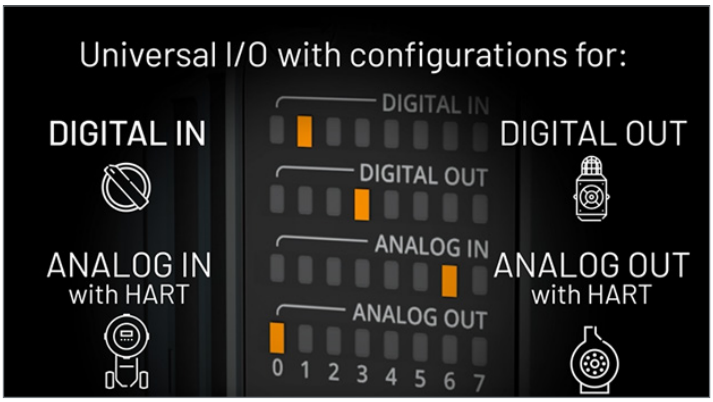
New FLEXHA 5000™ Modern I/O Platform Brings Flexibility and Reliability to Process Systems

Build this I/O into the truly redundant PlantPAx® architecture for maximum process uptime

The demands of today's fast paced industrial automation environment require a flexible and scalable solution that meet the challenges of today and tomorrow. The newest member of the Rockwell Automation® FLEX™ I/O family, the FLEXHA 5000™ I/O platform was engineered to meet the Process industry's evolving needs.

Expand PlantPAx®'s distributed and scalable architecture with the flexibility of Universal I/O, next generation High Availability, and Rockwell Automation's heritage of openness, connecting Hart-enabled process sensors and actuators through an FDT-enabled platform.

The FLEXHA 5000™ I/O's Universal I/O capabilities provide the ultimate I/O configuration flexibility. Whether you need analog or digital signals, you get reliability on each channel with fault detection and redundant switchover, which allows you to put focus back on making your products, because you've improved your system up time and reduced engineering efforts for commissioning and maintenance.



Meet your process information needs with the FLEXHA 5000™ I/O. Build this I/O into the truly redundant PlantPAx® architecture for maximum process uptime. Reduce system engineering efforts and respond to varying operating conditions with industry-leading HART diagnostics.

For more information on HART integration with PlantPAx® or the FLEXHA 5000™ I/O capabilities, visit the linked pages.

case study

Altivar Soft Starter ATS480 Integrated Digitally for Easy Engineering, Selection and Downtime Reduction

THE SOLUTION PROVIDES OPERATIONAL INTEGRITY FOR PEOPLE, PROCESSES, AND ASSETS

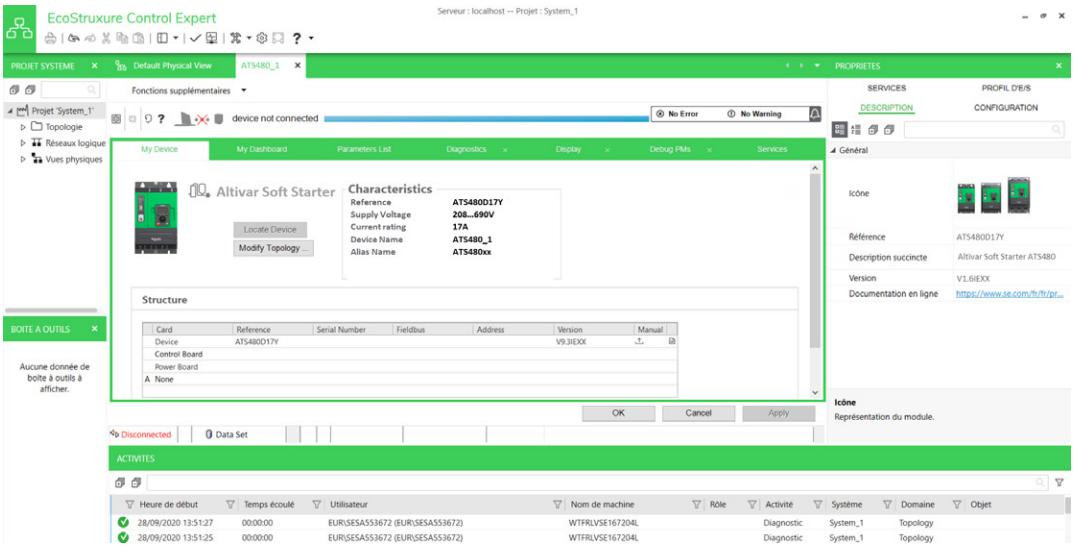
The new Altivar Soft Starter ATS480 is using FDT/DTM technology for intelligent device management (configure, control, diagnostics and maintenance) directly in EcoStruxure Control Expert, EcoStruxure Process Expert and SoMove software using the same software brick (DTM). FDT/DTM technology standardizes the communication interface between field devices and host systems. The DTM contains a uniform data structure for managing soft starter parameter access.

The Altivar™ Soft Starter ATS480, Soft starters for Process and Infrastructures from 4 to 900 kW, is the next evolution of soft starters that are digitally optimized to meet cyber security standards. Designed to address process infrastructures, ATS480 simplifies project execution and maximizes the availability of your applications, even in the most demanding environments.

With EcoStruxure tools (EcoStruxure Motor Control Configurator, EcoStruxure Motor Management Design, EcoStruxure Plant Builder, EcoStruxure Automation Device Maintenance, …), integrated automation system, and ATS480 Device Type Manager, process engineering time is drastically reduced from selection to project execution.

With ATS480 DTM, associated derived function block (DFB), and faceplate:

- Quickly write the PLC program in EcoStruxure Control Expert
- Integrate ready-to-use faceplate in AVEVA System Platform
- Adapt and modify parameters without stopping the installation
- Set, monitor, and diagnose from the engineering station
- DFB and faceplate available in General Purpose libraries



Altivar Soft Starter ATS480 DTM parameterization in EcoStruxure Control Expert

Advantages of the DTM library in EcoStruxure Control Expert:

- Single tool for configuration, setup, and diagnostics
- Network scan for automatic recognition of network configuration
- Ability to add/remove, copy/paste configuration files from other soft starters in the same architecture
- Single input point for all parameters shared between the ePAC (programmable controller) and the Altivar Soft Starter ATS480
- Creation of profiles for implicit communication with the ePAC as well as dedicated profiles for programs with DFBs (derived function blocks)
- Integration in the fieldbus topology
- Soft starter configuration is an integral part of the EcoStruxure Control Expert project file (STU) and the archive file (STA)

Ecostruxure Plant Integration

The association of Altivar Soft Starter ATS480 with Schneider Electric automation control systems like EcoStruxure Process Expert (for hybrid systems) offers a high-performance, global automation and motor control solution with optimized Total Cost of Ownership (TCO). The solution provides operational integrity for people, processes, and assets, with improved maintenance support to help reduce downtime ensuring operation continuity. It offers operational insight by accessing more information to optimize the process. Based on market standards (FDT/DTM, Ethernet, etc.), it is a sustainable, scalable solution that enables processes to be adapted easily and affordably. An integrated automation system powered by EcoStruxure offers the following benefits:

- More efficient projects
- Optimized operations

ATS480 DTM library

New Altivar Soft starter ATS480

Product selector for ATS480

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