FDT Mobility Secures Open Automation in the Age of Industry 4.0

HOW FDT 3.0-BASED SOLUTIONS HELP INDUSTRIAL PERSONNEL WORK SMARTER, FASTER, SAFER AND MORE EFFECTIVELY

Integrating Tomorrow's Technology

Contents

Abstract

A new age of industrial automation is being ushered in by rapid technological advancements in creating connected plants and factories. Mobile technologies are a key driving force to enable Industry 4.0 and further streamline manufacturing operations. Industrial companies want to harness the power of new technologies that hold the promise of smart operations.

The benefits of data capture and automation for enterprises can be seen in increased employee productivity, competitive advances, streamlined processes and improved operations. Being digitally mobile within the manufacturing environment means freedom of movement - being able to perform activities freely and at any location within the facility or remotely.

The latest advancements in FDT® 3.0 technology will drive a wider range of worker mobility applications in the Information Technology (IT)/Operational Technology (OT) environment. They help standardized and optimize industrial organizations and their operations and maintenance departments by enabling cloud-based enterprise data access, device diagnostics and mobility applications; modernizing asset management practices; and improving predictive maintenance programs.

With the recent developments to FDT, automation stakeholders can employ the familiar functionality of the integration standard on common mobile platforms. This, in turn, will provide access to additional data from any location with flexible deployment options.

The FDT mobility solution will benefit both control and instrumentation suppliers and end users. It applies a host of modern features to meet the contemporary needs for remote data access for the new era of automation. The familiar FDT Device Type Manager™ (DTM™) user interface has evolved to include a web interface environment incorporating browser-based visual solutions running on any authenticated mobile device on all networks. The FDT mobility solution is also platform-independent, which provides the flexibility to use any computing platform along with customizable app development. This approach contrasts with common proprietary, one-off solutions for industrial mobility applications.

Introduction

Industrial organizations following the path of digitalization want to do more with operational and business data, including accurate interpretation of the information and taking correct actions to ensure a desired outcome.

According to Mordor Intelligence, a leading market intelligence and advisory firm, the enterprise mobility in manufacturing market is expected to register a CAGR of 22.9% over the period of 2021-2026. With the rapid advancement of the Industrial Internet of Things (IIoT), manufacturing establishments are turning towards mobility solutions for help. Leveraging technologies like Machine-to-Machine (M2M) communication, industrial Big Data analytics, and cybersecurity, the IIoT is delivering higher levels of efficiency and performance to its users. As a result, it is changing the way people communicate and operate in a manufacturing environment.

At many industrial facilities, control room and field operators have taken on a critical, multi-faceted and data-empowered role due to the ability to leverage data from many sources, make objective decisions based on real-time information, and understand the industrial control system (ICS) to solve problems.

At the same time, plant managers and maintenance technicians must be able to access information from IT and OT assets easily from anywhere in the facility their jobs may take them. This corresponds to the growing need among industrial asset owners to mitigate the risk of connecting their OT networks to the cloud as well as to their IT corporate networks.

Regardless of their role within an industrial operation, workers need solutions to help improve their capacities and efficiency, which manifest in the form of improvement in enterprise processes.

Today's Industrial Outlook

Mobility technology is transforming today's smart manufacturing environment. This trend is accelerated by the Industrial Internet of Things (IIoT) and Industry 4.0 initiatives, whose goals include empowering an intelligent enterprise through a smart, connected automation ecosystem.

Just as business email applications migrated from the desktop to smart devices in recent years, users in the industrial control market now have similar expectations for performing life cycle maintenance practices—configuration, diagnostics and other related functions on a mobile basis.

Flexibility is critical on the modern manufacturing floor, and mobile platforms can provide the support needed by industrial organizations and their customers.

Need to transform processes and productivity. Just as mobile solutions have changed the way society communicates and connects, they are altering the landscape of plants and factories. With visibility, information and control literally in workers' hands, production processes and productivity are dramatically transformed.

Experience has shown that mobility is an enabling technology that enhances the ability to:

- Improve service efficiency
- Reduce maintenance costs
- Increase equipment uptime
- Extend asset life
- Enhance the bottom line

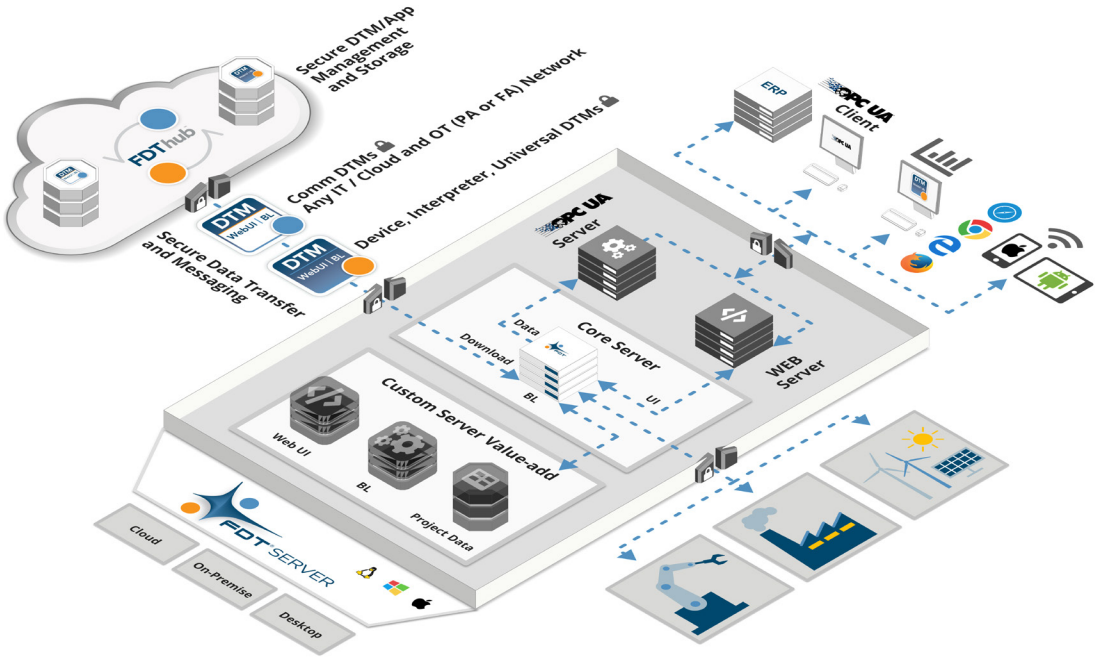
Demand for increased enterprise data access. Mobility's move from management offices to production operations couldn't come at a better time. With the arrival of IIoT technologies, manufacturers are already seeing changes in enterprise data capture and analysis. Predictive and contextualized information is quickly becoming the norm, along with immediate access to data details and resolutions.

In the process, hybrid and discrete manufacturing sectors, facility owners/operators need solutions to mobilize real-time remote operations. The goal is to expand secure access to critical device and network data to increase productivity while creating a safer workplace.

Evolution of the Global FDT Standard

FDT Group, an independent, international, not-for-profit industry association consisting of leading companies and organizations active in industrial automation, continues to evolve its open standard for enterprise-wide network and asset integration as a data-centric platform. The organization is dedicated to meeting the requirements for mobile device connectivity on the industrial shop floor and in the field. Its goal is to enable automation end users to employ the functionality they appreciate in the FDT integration standard on all of the leading mobile platforms. This mobility integration will provide access to additional data—at anytime and anywhere—with flexible deployment options.

Establishing a standardized IIoT ecosystem. FDT Group's new, forward-looking FDT 3.0 standard, including the FDT IIoT Server (FITS™) platform, is accelerating the evolutionary journey of the organization and its technology into the Fourth Industrial Revolution. Developed from industry-driven feedback and providing a bridge between the current FDT installed base and next generation solutions, the updated standard empowers an FDT-based IIoT ecosystem to meet the demands for digitalization and Industry 4.0 applications.



FDT is the only standard of its kind providing an open architecture with standardized, built-in mobility and remote access; native OPC Unified Architecture (UA) integration; robust security; and platform independence, while still leaving the manufacturer in control of customizing their product or solution.

FDT is an open and adaptable technology and continues to grow based on the needs of the industrial automation sector. The FDT 3.0 standard is well positioned as an integration standard supporting the convergence of IT and OT networks across the industrial enterprise.

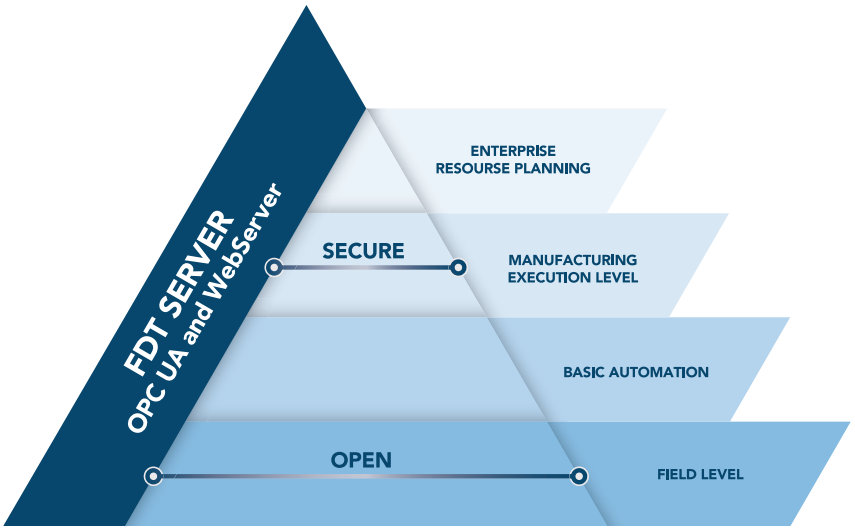
Enabling a platform-independent environment. At the core of FDT Group's digitalization approach is the new FDT Server, which empowers a robust, platform-independent environment. The FDT Server natively integrates an OPC UA Server for enterprise-wide IT/OT data access and a web server mobilizing remote operations. This innovative solution transforms asset management practices and business system integration for both automation suppliers and end users in the process, hybrid and discrete manufacturing markets.

FDT 3.0 provides a standardized mobility environment through the new FDT Server solution. This modular, flexible and scalable architecture is now web server-based, and the clients are web browsers. This enables plant or factory workers to employ a standard web browser to perform a wide range of duties in the field using a tablet, smart phone and other type of mobile device.

A major difference between the earlier FDT 1.2 standard and FDT 3.0 is separation of the graphical user interface (GUI) and business logic, since the current technology platform is Web User Interface (UI)-based.

The FDT IIoT architecture works with any major web browser—and requires no changes to installed devices, the programmable logic control (PLC) or distributed control system (DCS) to access real-time plant floor data. It should be noted that the use of web browsers for mobile functions comes with a number of security issues. Fortunately, the FDT architecture is secure by design due to the use of robust multi-layered security and vetted industry standards such as Transport Layer Security (TLS) enabling Web Sockets Secure (WSS) and Hyper Text Transfer Protocol Secure (HTTPS). This security strategy encompasses encrypted communications using TLS, role-based user security, X.509v3 certificates for device authentication, and on-the-wire-security for enabled industrial control protocols.

Keeping pace with related industry efforts. The latest FDT 3.0 technology developments are also closely aligned with the NAMUR (NE 175) Open Architecture (NOA) initiative, which addresses asset monitoring and optimization requirements in industrial processing facilities. The FDT Server provides a second channel for device health and maintenance activities. As such, it is no longer necessary to rely on the DCS or PLC as an information broker. The FDT architecture is situated in parallel to the supervisory control system and has direct access to all the end devices. This approach is in keeping with the NOA recommendations, which state that suppliers of asset management applications should be separate from suppliers of DCSs or PLCs, and that separate information channels should be established to eliminate dependencies between the systems for asset management activities.



FDT supports open and secure automation evolving the existing install-base and new greenfield applications.

FDT 3.0 also provides an open solution to keep pace with emerging standards such as the Advanced Physical Layer (APL) and Time-sensitive Networking (TSN) for Industrial Ethernet.

New Mobility Capabilities of FDT Technology

The key driver of FDT's support for mobility functionality starts with its essential technology component—DTMs running the new FDT 3.0 standard. These DTMs are essential for the visualization of smart devices across the enterprise. They contain the business logic software that defines online and offline parameters, the device model, and bus mapping for each automation device.

Utilizing an integrated development environment. With the introduction of the FDT 3.0 standard, FDT Group is helping the vendor community jump start DTM development with a modernized Integrated Development Environment (IDE). FDT 3.0 DTMs encapsulate all device-specific data, functions and business rules and serve as standardized "drivers" enabled with a customizable Web UI, which employs HTML 5.0 and JavaScript for displaying a graphical representation of parameterization, diagnostic and prognostics across mobile devices and browsers.

Unlike DTMs based on the FDT 1.2 or FDT 2.0 standards, FDT 3.0 DTMs follow a common style guide and employ stylized, responsive touch screen features, which are mandatory for use with tablets and smart phones. FDT Group is the first industrial standards organization to require style guide compliance for developers as part of its Device DTM certification process. It is also the first organization in the automation market to include responsive technology features in its style document. Style guide and DTM compliance go hand-in-hand with FDT 3.0.

With the FDT 3.0 standard and its updated style guide, the approach to the DTM interface includes a completely uniform design focused on mobilizing secure remote access independent of the device, system, browser, phone, operating system, etc. The style guide describes elements of the automation interface in the HTML5 JavaScript world, so it is based on a state-of-the-art approach. The FDT 3.0 Web UI is suited to a new generation of workers who are digital natives and expect to use web-oriented technologies.

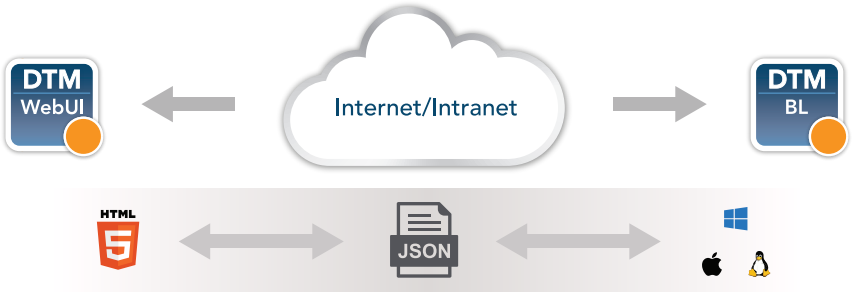
Thanks to FDT 3.0, a device vendor can support simple to complex devices with custom parameters to meet the engineering needs of their customer base. The vendor has complete control of parameterization while the style guide provides the consistent and uniformed approach to represent relevant data at a glance. There is the same user experience, no matter the DTM.

FDT Group's updated FDT 3.0 DTM Common Components—the only platform-independent development tools of their kind in the industry—help to minimize engineering effort, simplify DTM certification and shorten time to market for new product offerings. In addition to an advanced Web UI, the latest enhanced FDT features supported by DTM Common Components include platform independence, auto-enabled OPC UA compatibility, customized graphical parameterization and rigorous DTM security.

The native integration of OPC UA for DTMs means no additional coding or work is required. This approach makes it possible to publish data for a wide-range of purposes and provides end users with an out-of-the-box solution for accessing DTM information and providing it to cloud-based applications.

"Flattening" the automation architecture. New generation DTMs automatically make device data and health information available via an OPC UA Server embedded on the FDT Server used in the FDT 3.0 architecture. As such, asset management is now deployable as a cloud service as part of an IIoT or Industry 4.0 initiative. This architecture "flattens" the automation pyramid so that any application requiring data from devices can retrieve it directly from OPC UA through the DTM.

All FDT 3.0 DTMs comply with the NAMUR NE-107 recommendation, which stipulates that operators need a view of the process including the status of the instrumentation in a simple and uniform way—regardless of source device—to support predictive maintenance strategies.



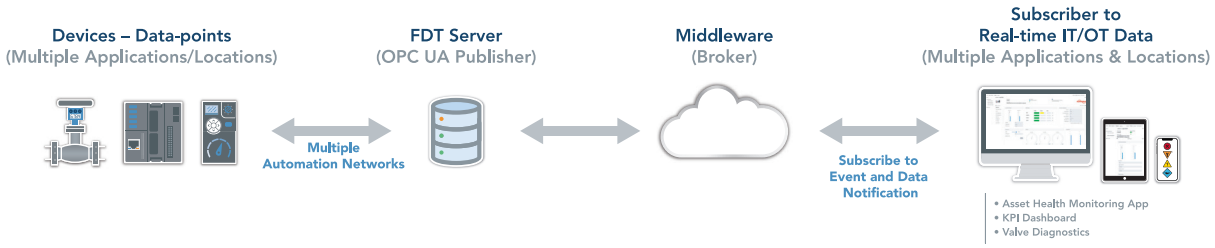
Messages between the **DTM WebUI** and
the **DTM Business Logic (BL)** are encoded in **JSON** format

Deploying a web-based user interface. FDT 3.0 DTMs have further evolved with business logic shifting to .NET Core platform independent technology and the UI moving to web-based technology, thus diversifying the presentation of asset-related device information. The use of web technology allows server-based distributed architectures to enhance the user experience with mobile and remote access solutions.

The Web UI with FDT 3.0 allows DTMs to be opened in any browser, including mobile devices carried by field personnel. It also provides a standardized mobile access approach utilizing apps, standalone applications, or anything else capable of interfacing via web sockets. Manufacturers can utilize the technology's standardized mobility platform as part of their service functionality, helping site engineers solve problems with remote assistance.

Offering flexible communications options. With the FDT 3.0 standard, the FDT Server is a distributive architecture that offers the option to utilize either an OPC UA Client/Server environment or the OPC UA Publish-Subscribe (PubSub) communication model depending on the application and the needs of the end user. The FDT 3.0 OPC UA Server supports a Client-Server-based request-response communication mechanism between the OPC UA Client and generic client applications. This approach makes the full range of information model access available via services and, in doing so, follows the design paradigm of Service-Oriented Architecture (SOA), in which a service provider receives requests, processes them and sends the results back with the response.

FDT 3.0 - OPC UA PubSub Communication



Going forward, the PubSub communication model will provide an alternative mechanism for data and event notification with FDT 3.0. While in Client-Server communication each notification is for a single client with guaranteed delivery, PubSub has been optimized for on change-only, one-to-many configuration. The PubSub approach is essential for secure multicasting, one-to-many publishing, machine-to-machine communication, dynamic network relations, and several additional scenarios.

Enabling the FDT OPC UA Server with OPC PubSub communication will significantly reduce communication traffic between asset health monitoring applications and the server application, thus improving performance and making the solution scalable to IIoT requirements. Remote monitoring applications will be able to monitor asset health on a different network in real-time, using bridging protocols like AMQP and MQTT.

Providing remote access to device data. Remote access with Web Services will enable 24/7 observation of devices. Any mobile device authenticated by the FDT Server and operated by an authenticated user will have full access to the topology with a tunneling capability to manage assets on any network. These features will result in the development of new apps to optimize asset management, preventive maintenance and other critical functions at modern process plants.

All data is now harmonized within the FDT/OPC UA Information Model and presented in a logical, defined and uniform manner. Even device-specific information is provided in a standardized way while still customizable based on individual application requirements. The look-up of information is the same for users of all clients, even though the devices may be significantly different.

Thanks to the FDT standard, the ability to integrate diverse plant and factory information enables personnel to mitigate process upsets and instrument malfunctions. The combination of measured values, valve openings and device diagnostics helps identify specific deviations in operation and instrument performance. This level of interoperability and true advanced diagnostics is optimizing modern plant and factory operations.

Industrial end users can also create mobile apps to meet their unique operational requirements and access specific information from individual DTMs. This might include an operational-type app showing any devices with a "Needs Attention" status, or a management-type app providing hourly production results from a given line or facility. These tools can be developed independent of the DCS or PLC application. FDT's open interface makes it possible to extract data from devices and report it in the app without the need for any additional coding.

Putting FDT Mobile DTM Solutions to Work

By focusing their development work around the FDT standard, automation equipment suppliers can leverage the advantages of both a modern web interface and a fully-enabled OPC UA environment supporting advanced mobility capabilities. DTM developers can simplify their efforts through the use of FDT Common Components (DTM, Server and Desktop) toolkits, which provide a fast way to view DTMs in an FDT Desktop or FDT Server hosting application and understand the communication flow between them. The toolkit's web UI allows developers to see how different DTMs work together across various machines and operating systems.

Improving asset management strategies. The latest advancements to FDT technology are mobilizing the monitoring of industrial facilities and processes, as well as specific networks and devices, as part of modern asset management strategies. Lifecycle monitoring and maintenance can now be done with FDT's new standardized mobile interface or via web browsers through smart phones, tables, laptops, desktops, etc. in a way that's fully integrated with DCSs, PLCs and other control assets.

For the simplest to the most complex operations, FDT-enabled mobile applications will empower plant personnel to work smarter, faster and more effectively to keep assets in top operating condition. They will gain the ability to complete tasks and record notes directly at the instruments they are maintaining and repairing. In fact, field workers who use mobile devices to access equipment maintenance data will report more frequently and with higher accuracy.

No other industrial integration standard enables end users to browse through their installed base of networks and devices to see what data is available and then put this information to work to meet different operational demands.

Developing specialized mobile applications. With the new generation of DTMs providing platform independence, it is now possible to use mobile applications on different platforms and classes of devices. For example, the developer can write a DTM and then provide the same UI on a laptop, tablet, desktop, or phone—no matter the operating system. Since DTM UIs are now portable and can also be displayed in browsers on handheld devices, developers can create user interfaces that are completely responsive per the needs of different devices and screen sizes.

FDT 3.0 | Universal Platform

With apps employing FDT Web Services, for example, maintenance technicians will no longer be bound to a centralized tool or handheld device connected to an individual instrument; instead, they can use tablets, smart phones and other mobile devices to carry out their daily activities. This includes solutions bringing FDT data much closer to the engineer or technician and enabling troubleshooting and monitoring of instruments' critical operating parameters to be performed remotely to ensure they are functioning according to specification. Additional maintenance benefits will include the ability for field workers to take pictures or scan bar codes with their secure, authenticated smart phones or tablets to provide a host of device-specific information. Programmers will have the option to write algorithms to simplify reporting.

Conclusion

From business decision-making to process workflows, user interfaces, and proactive maintenance, new utilizations of mobility technology are drastically changing the way manufacturing gets done.

FDT Group's standard is now empowering the industrial workforce with flexible deployment and mobility solutions intended to optimize facilities with agile operations. With the latest FDT 3.0 advancements, the technology maintains its core communication and diagnostic capabilities, but also offers robust, multi-layer security to enable secure remote access to data through mobile devices and web sockets so other applications can take part in the seamless exchange of information.

Indeed, FDT 3.0 will open the automation architecture to allow for more points of access from a data and user interface perspective. This capability is crucial for realizing the promise of Industry 4.0 in all types of industrial applications.

Empowering the Intelligent Enterprise

For More Information

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