

FEBRUARY 2022



# Real-Time Data

**Unified Environment  
Enables Multi-purpose  
Digital Twins**

# Unifying Automation for Industry Success

## Advancing open-based systems with service-oriented solutions

Author: Lee Lane, Chairman of the FDT Board of Directors



**Lee Lane**  
Chairman of the  
FDT Board of Directors

Welcome to 2022 and our first editorial of the year! We hope you enjoyed the holidays with family and friends and found time to relax and reflect — welcoming the new year with optimism. As FDT Group closed out 2021, we said our goodbyes to Glenn Schulz and wished him well in retirement, reflecting on challenges, successes, and the bright journey ahead as we passed the baton to our new managing director Steve Biegacki. We are thrilled to have Steve's expertise and leadership skills to guide the FDT mission forward — transitioning FDT's (3.0) next-generation IIoT ecosystem (server and dtm), from 'product' form to 'integrated' marketplace solutions. FDT's +20-year competency in embedded industrial systems, higher-level engineering applications, and devices for configuration and lifecycle management has been modernized. It's here and available today, offering new OT/operational and IT/business benefits while seamlessly bridging today's applications with tomorrow's smart factory needs.

FDT's new embedded Server environment and web based DTM are modernizing engineering applications/systems, allowing device intelligence to permeate freely throughout a sensor to cloud architected application with both OPC UA and FDT client access, including mobility. The unified server (inclusive of an OPC UA server and web server) environment maintains the core FDT strengths for integration, engineering, and configuration, but now benefits both the IT and OT workforce with a service-oriented data hub architecture. FDT is recognized globally as the de-facto integration standard in part due to its large installed base of devices and systems in control system architectures. Its environment is trusted by the vendor and end-user communities due to its transparent, holistic, and easy-to-use nature, allowing seamless control of a unified application topology no matter what networking protocols are used. By using the FDT (3.0) United Environment (UE) server, the automation industry can realize — open, sensor to cloud data interoperability and access that erases dependences based on the operating system, vendor, network (PA or FA), or other proprietary solution.

Take a moment to think about the needs of the industry focused on true open automation solutions. What are your open automation business models needs for new era systems and devices, bridging today and tomorrow automation requirements? If you haven't thought about including FDT3 in your design, or installation, be sure to click on this [resource link](#) and learn more about FDT3 and its inherent, embedded benefits for scaling next-generation automation solutions. Whether you are in the process or discrete industry, a vendor or end-user, FDT empowers the business and operational workforce with a unified environment offering data-driven business models enabling IIoT and Industry 4.0 applications.



# Digital Twins Improve Plant Design and Operational Performance

FDT enables simulation environments for better,  
faster decision making

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While many emerging technologies are crucial to advancing the Industrial IoT (IIoT) — including advanced analytics, artificial intelligence (AI) and machine-learning (ML) — according to [ARC Advisory Group research](#), connected smart assets and especially the digital twin are having the most immediate and significant impact on how companies implement smart manufacturing.

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## Digital Twins in a Converged World

A digital twin is a virtual copy of something as straight forward as a device or as complex as an entire business system. Created using data from sensor technologies, the data gives users both structural and operational views of what happens to the device or system in real-time. With that data, users can monitor, model, and adjust the digital twin to see how virtual changes would affect the original device or system before committing to the change in the real world.

As more companies move toward the IIoT and converging Information Technology (IT) and Operational Technology (OT), digital twin is one emerging technology that can impact the entire industrial architecture - product solution ecosystem, communication, and integration standards.

IT is focused on the use of computers, storage, networking, infrastructure, and processes to create, process, store, secure and exchange all forms of electronic data. OT includes hardware and software that detects or causes a change through the direct monitoring and/or control of intelligent sensors and actuators.

While IT and OT have different interests and requirements, the merging of these worlds opens the door to innovative IIoT solutions — like digital twins. This technology is revolutionizing a manufacturer's ability to use integrated IT/OT data to design and employ models that form the basis for increasing overall efficiency, quality, and agility.

## Visualizing Your Factory

Converging IT/OT data in one platform supports visualization of the factory as a whole. This is how OT and IT decision-makers will receive productivity status updates consistently and on time, which enables them to make more accurate business decisions.

Manufacturers looking for IT/OT convergence benefit from a secure, scalable, and adaptable platform that provides embedded configurable end-to-end trusted interoperability supporting cloud, edge, on-premises, or enterprise-wide agile architectures.

FDT's strength in visualization and data analytics enables seamless integration of automation system assets (current

installed-based and new solutions), control applications and edge devices throughout the global industrial sector, as well as expanded access to critical operational data. This strength extends to emerging technologies — like digital twin — supporting:

- Better decision making
- Improved data insight and visualization
- More modern and consistent workforce training
- Efficient standard operating procedures

## FDT (3.0) Unified Environment Enables Multi-Purpose Digital Twins

Because a digital twin represents a real-world object, like a device, it can be used for planning, simulation, commissioning or enabling access to the object. Often a digital twin serves one purpose, but many projects use one digital twin for multiple purposes, like planning and simulation.

FDT brings together the worlds of IT and OT, and systems and devices. Because the FDT server environment encompasses two servers, there are operating benefits and economic (business) benefits for different configurations and simulations of devices or processes. Digital twin drives data analytics and operational insight. The strength of FDT has always been analytics — and now those analytics are even richer, with better device diagnostics and better performance.

For industrial companies seeking proven solutions supporting the convergence of business information and plant operating technologies, FDT Group's new FDT Unified Environment, (also known as the FDT3 standard), with its FDT Server and built-in OPC UA Server solution, enables robust IT/OT integration and provides a secure gateway to network/device data and health information. The standard offers OPC UA Client/Server-authenticated access to plant application data, and its utilization of a Publish-Subscribe environment allows for real-time data exchange.

FDT Device Type Manager™ (DTMs) provide documents for device types as well as for specific device instances to extend support to other use cases. For instance, it is possible to provide an eCL@ss description for a device type to support detailed engineering or link maintenance

documents for a device instance to support lifecycle management. The DTM can serve as a hub to all device-related information.

FDT3 provides an accepted standard for deploying and integrating a digital representation of a device to many platforms. Because of FDT3, it is possible to integrate a DTM into a web server, which allows remote access to device-related services like monitoring, diagnosis, and parameterization. Also, it is possible to integrate DTMs into an OPC Server, that supports application-level integration — for asset management or for ERP, for example. The OPC Server may support an information model according to the FDT OPC Unified Architecture (UA) Information Model.

### Major Benefits of Digital Twin Environments

The FDT Server with OPC UA enable system providers with digital twins for simulation and virtualization of automation systems, I/O systems, and processes.

The main reasons for introducing digital twin technology into a production system is to improve access to information related to the production process and to improve flexibility of the production system. This applies to existing production systems as well as to newly planned production systems.

For FDT, supporting access to device related information is not new — it's been a core competency for more than 20 years. Originally, the capability was mainly as in-process representation of the device, but with FDT unified environment the focus has evolved from an in-application representation of the device to providing a server-based representation of the device. With the FDT environment it is possible to have one server which provides a package of device-related information and services. The server then can be used to support very different use cases related to the device.

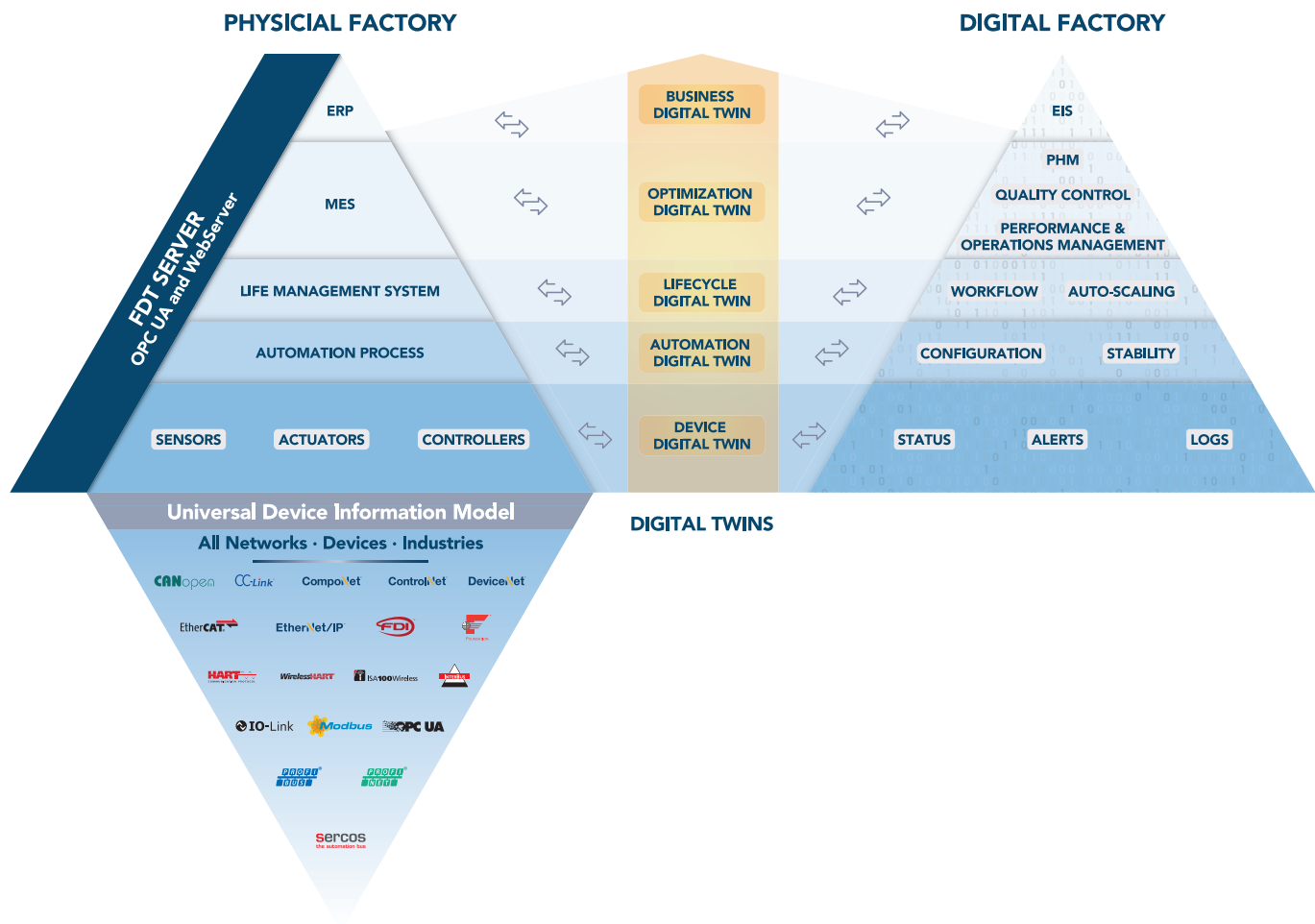


Figure: Embedded FDT Server environment enables digital twins, sensor to cloud

A DTM provides packaged information about all supported device types. Today this typically includes documentation as well as protocol support files. It would be easy to use the DTM to provide files for simulations or for virtual commissioning. If such files are provided via link, the device vendor could maintain and update such files without updating the DTM.

The business benefit for device vendors is that they need to support only one solution for multiple purposes. The DTM package can support traditional service and IoT use cases. The business benefit for an end user is that they can use a well-established, mature technology as the base for their information access.

### Digital Twin Improve Plant Design and Operational Performance

Digital twin improves control and configuration for the lifecycle — including improving plant design and operational performance — through semantic interoperability.

Currently there are many ways of providing support for plant design. Also, there is no common solution for transferring knowledge from early phases of the production system lifecycle (like from plant design) to the operation phase.

If the device data for supporting plant design would be annotated with semantic information, it would be easier for system planners and operators to understand device data and the relationship between the planning data and the current configuration of the device. With the FDT OPC UA information model it is possible to access this information from any user application.

### Expanded Connectivity in the Modern World

Implementing the FDT/OPC UA model offers expanded connectivity of engineering, distributed control, asset management and other systems as part of IIoT and applications in the modern connected world.

FDT is the only open, scalable, secure, and interoperable architecture for the modern industrial enterprise. The technology provides a vendor-neutral software interface for integrating assets and delivering access to device intelligence for end-users with process, factory (discrete) and hybrid operations. In these diverse markets, with unique operational requirements, the technology enables a common environment for utilizing smart devices’ most sophisticated features.

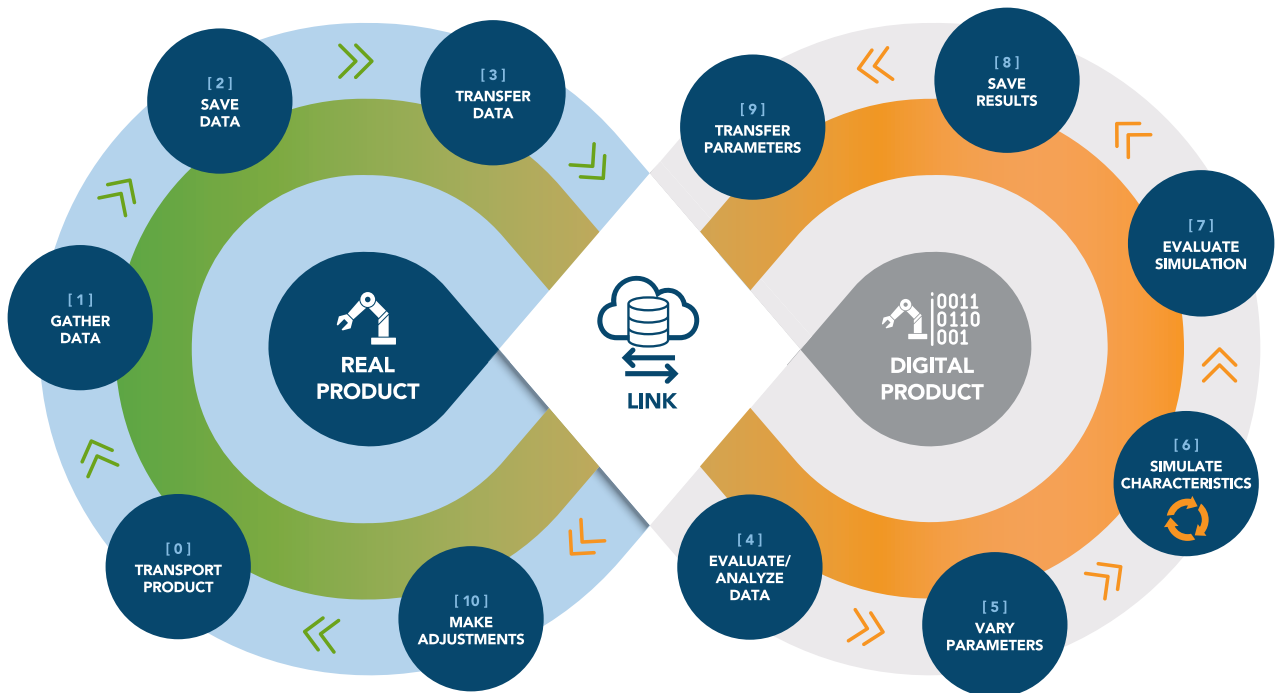


Figure: FDT Server enables digital twin product simulation as part of the lifecycle

This architecture allows everyone and everything — people, processes, and technology — to work better together.

Commissioning and start-up are two of the most crucial use cases for digital twin, as people become less dependent on physical devices. The value of digital twin is in quicker configuration and modernization of lifecycle process in a simulated environment.

Imagine operating with all the accuracy but without the boundaries of a physical device. The simulated device can understand the environment and sends values back to the user. The information model is coming directly from device.

FDT is bridging the real world and the virtual world, enabling secure communication across any network and hierarchy of networks allowing modeling of any protocol or device. With digital twin it will be possible to change applications and use DTM's to configure, simulate, check behavior, make decisions and learn from history.

FDT's expertise in control and confirmation enables digital twin so both vendors and users will realize significant benefits.



**For more information  
about FDT3 visit:**  
[fdtgroup.org/innovation](https://fdtgroup.org/innovation)



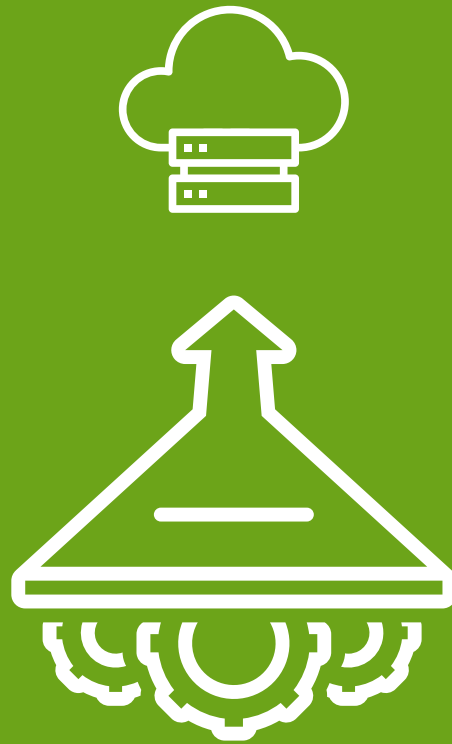
## **FDT Unified Environment for Industrial Device Management and IT/OT Data Transport**

Unification through industry collaborations is key to harmonize technologies, solutions, and people for today's infrastructure and tomorrow's intelligent enterprise. The FDT (3.0) Unified Environment (UE) merging the IT/OT data domains needed for smart manufacturing strengthens the core of any automation system with a universal approach to industrial device management and data transport opening the door to innovative service-oriented business model solutions reviving manufacturing's critical infrastructure.



**Learn more and download  
the white paper.**





# Open Standard for Sensor-to-Cloud Integration



Did you know that all networked devices can be FDT-enabled? It's true. There are millions of them in service around the world. FDT offers secure, seamless, standardized integration and information exchange for the intelligent enterprise.

Now, with FDT 3.0 all that device data is available in a universal, single FDT IIoT Server solution. Imagine an integrated web server mobilizing field device management and a natively integrated OPC UA Server for enterprise real-time device data access.

Empower Innovative Business Models: [fdtgroup.org/innovation](http://fdtgroup.org/innovation)



Empowering the Intelligent Enterprise

# Digitalizing Asset Health Maintenance Process to Improve Overall Plant Performance

Maintaining process plant assets (mechanical equipment or field devices) is critical but cumbersome. Most plant engineers elect calendared maintenance, but even it has blind spots. Assets do not fail per a plan — even with watchful eyes, plant assets can fail unexpectedly causing severe damage to plant processes, other machines, equipment, and asset operators.

Two major challenges that prevent plant operators from maintaining assets digitally are — *lack of normalized field diagnostic data and the absence of an IAMS application to predict asset failure.*

The heterogeneous make-up of process plant assets restricts the plant engineers from analyzing the assets' health due to inconsistent device data patterns. On top of this, the lack of an asset management platform makes it difficult to have a comprehensive view of all the assets' health.

## Challenges

Due to the lack of normalized device diagnostic data at a central point of access, plant operators and asset maintenance engineers face some critical challenges like the following:

- Difficulties in identifying outlier failures
- Unplanned shutdowns causing loss of production
- Troubleshooting and repairing failed/damaged assets take more man-hours causing rising asset idle time
- Manual maintenance unable to account for constant abrasions of plant assets
- Depleting device performances go unnoticed often
- Complex to manage huge asset fleet manually

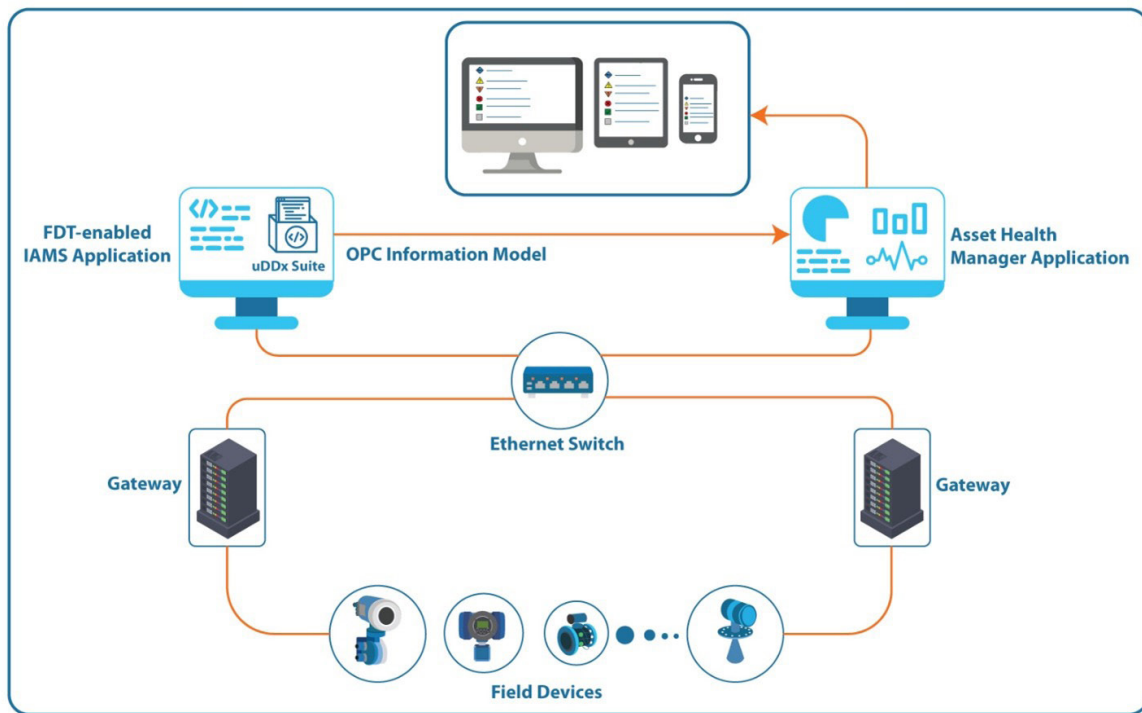
## Solution

To solve these challenges, Utthunga recommends using the uDDx Suite to normalize device diagnostic data and an asset health manager application to help maintenance engineers analyze data to predict asset failure.

These challenges can be resolved in 3 steps:

**Step 1:** Use existing FDT-enabled IAMS systems and the physical communication network that includes gateways, devices, multiplexers, I/Os, etc.

**Step 2:** Install Utthunga's uDDx Suite as part of the FDT-enabled IAMS application. uDDx suite will use the IAMS communication channel to retrieve device diagnostics and status-related information in a normalized fashion. This enables IT applications access to the data.



uDDx Suite will poll the critical asset diagnostic data such as device identification, device diagnostics, process values, device core parameters, etc., using its DTM component. Later uDDx Suite's OPC UA component will use this data to construct the OPC UA information model according to PA-DIM.

**Step3:** Install Utthunga's asset health manager application and configure it to communicate with the uDDx Suite. The asset health manager application will retrieve the asset health data from the uDDx Suite and publish it on the comprehensive dashboard. It will allow users a snapshot view of various device health stats categorized based on NAMUR NE 107 with alert details. It allows maintenance engineers the ability to prioritize troubleshooting/maintenance actions accordingly.

## Benefits

By deploying the above solutions, plant operators and maintenance engineers will achieve the following benefits:

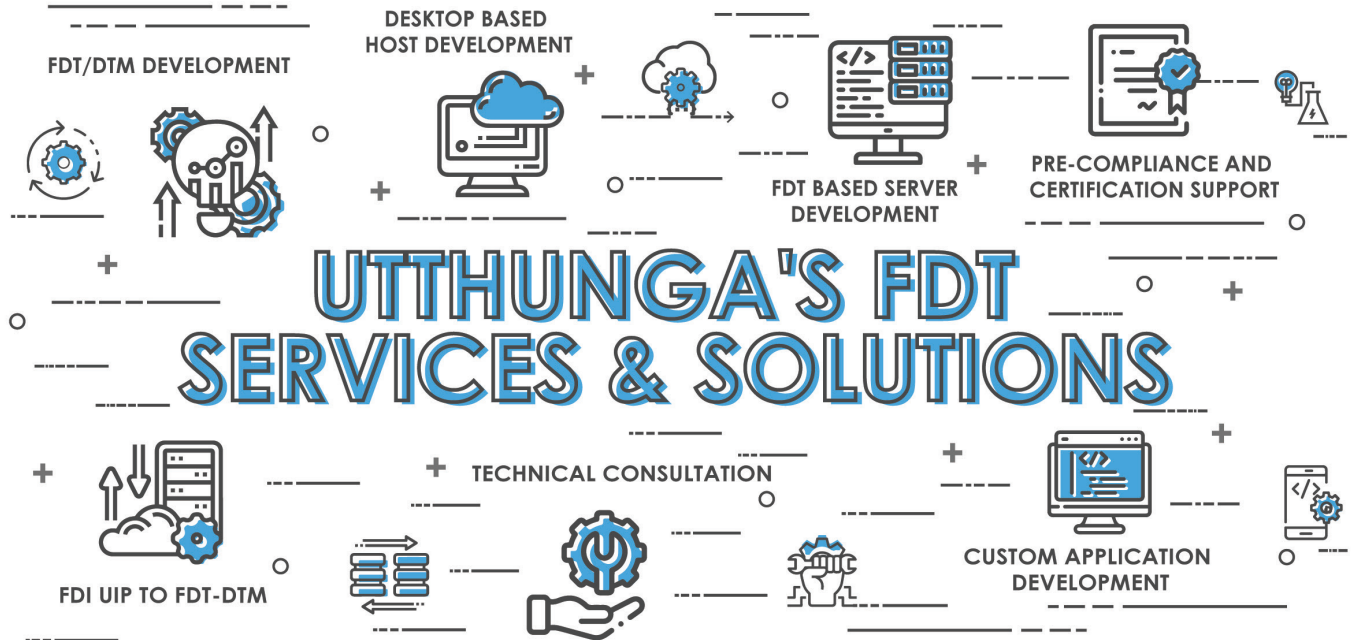
- 10% reduction in unplanned shutdowns
- 75% cut in troubleshooting time as maintenance activities can be planned before the assets stop working
- 1500 man-hours reduced due to the ability to configure and calibrate assets remotely using the IAMS application
- One access point to view all the alerts based on the device health status



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AS PER PA-DIM



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The Yokogawa FieldMate Versatile Device Management Wizard is a FDT compliant PC-based integrated software tool that handles parameter setting for intelligent field devices, regardless of their make or field communication protocol. FieldMate speeds up device configuration and problem solving, and automatically stores a work log for a traceable field maintenance database that consolidates the maintenance work flow and facilitates the sharing of maintenance know-how. In addition, FieldMate synchronises seamlessly with Yokogawa's PRM Plant Asset Management solution.

[yokogawa.com/Fieldmate](http://yokogawa.com/Fieldmate)

**YOKOGAWA** 

# “Quick Monitoring by DTM” for Machine Condition Monitoring Applications

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## DTM PROVIDES FUNCTIONS SUCH AS GRAPH DISPLAY, TREND DISPLAY, AND LOG ACQUISITION TO VISUALLY CONFIRM CHANGES IN SOUND LEVELS AND FREQUENCIES

Yokogawa Electric provides the wireless noise surveillance system, which improves plant safety by remote monitoring technology. This system is a new digital HSE system consisting of WN 30 noise map software and multiple WN 100 wireless sound level meters that provides a real-time noise monitoring system for high-noise environments such as offshore platforms. It was developed to prevent hearing impairment of workers and to optimize working hours limited by noise levels.

In addition, the application of the wireless noise surveillance system has been expanding not only for the HSE application but also for equipment condition monitoring. In this article, we introduce “Quick Monitoring by DTM”, which is expected to further expand applications.

## Increasing expectations for machine condition monitoring applications

As a original specification, the wireless noise surveillance system has allowed for area-by-area noise maps, sound levels per WN 100 and constant monitoring of the frequency analysis data.

However recently, there has been requests from customers to utilize the sound level data and frequency analysis parameter of WN 100 as the data for noise monitoring and diagnosis of equipment failures and abnormalities with limited measurement targets in a minimum configuration consisting of WN 100 single unit and ISA 100 wireless communication.

## WN100 ISA100 DTM

To meet the customer's requests, Yokogawa's new WN 100 ISA 100 DTM provides functions such as graph display, trend display, and log acquisition. This makes it possible to visually confirm changes in sound levels and frequencies without depending on the host system.

Combining the WN 100 ISA 100 DTM with the WN 100 makes it relatively easy to graphically display sound-level DATA and Trend displays via the ISA 100 wireless infrastructure or infrared communication with devices, as well as graphically display frequency analysis DATA. Thus, the difference between the normal condition and the abnormal condition can be noticed from, for example, the noise from the equipment such as a compressor, the noise from the surrounding environment, and the change of the frequency, and it becomes possible to correspond to the predictive maintenance.

## Available sound level parameters

WN100 ISA100 DTM can shows three kinds of frequency weighted sound levels: LAeq, T (A characteristic time average sound level), LCEq, T (C characteristic time average sound level), and LCpeak (C characteristic peak sound level). The A characteristic is a frequency curve which is the same as the sensitivity of the human ear, and the sensitivity becomes low in low frequency and high frequency band. The C characteristic has a relatively flat shape compared with the A characteristic. LAeq, T and LCpeak are mainly used as a parameter for noise exposure limit and environmental noise. Moreover, the application as a conditioning monitor which detects the failure and abnormality of the equipment by the sound generated from the equipment is noticed from the change information of the frequency component by LCEq, T and LCpeak, 1/3 octave band analysis.

Figure. 1 and 2 show screen examples of a sound level viewer and an octave band viewer, respectively.

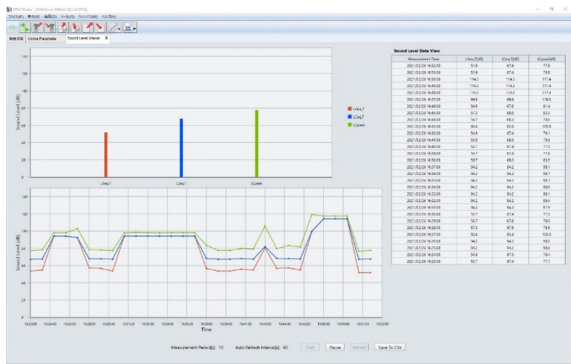


Figure 1: Sound Level Viewer

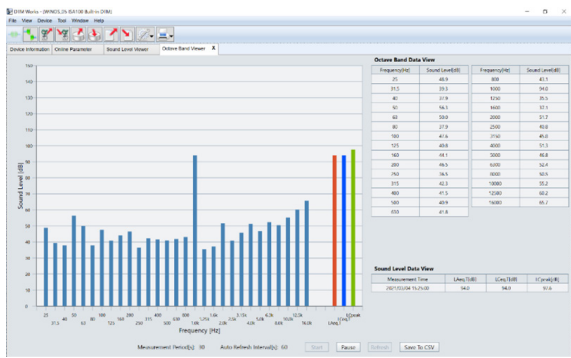


Figure 2: Octave Band Viewer

System configuration

Figure. 3 shows an example of the system configuration of the package solution. WN 100 ISA 100 DTM is a standard package of FieldMate software installed on PCs. WN100 ISA100 DTM receives measurement data via ISA100 via wireless infrastructure or via infrared communication.

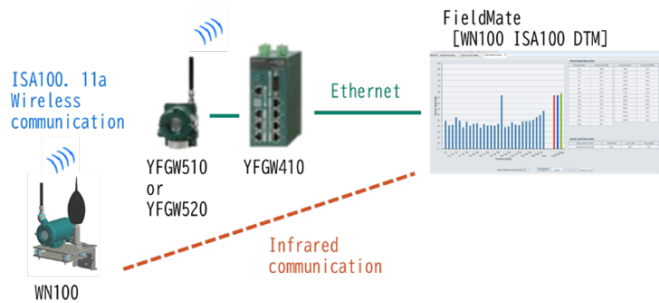


Figure 3: Package Solution System Configuration

The WN 100 is wireless, battery-powered and can be easily installed anywhere, so that combination of the wireless device and DTM is suitable for quick data monitoring and data acquisition for machine condition monitoring.

The WN 100 ISA 100 DTM is provided as bundled software with FieldMate, the device adjustment, configuration and management software used for device deployment, making it easy to deploy without adding other software or devices.

Case study

Here is a successful example of a machine conditioning monitoring.

Two units of WN 100 and WN 100 ISA 100 DTM were introduced as packaged solutions for monitoring blower and compressor conditions at a customer site.

As a condition monitoring kit with Yokogawa’s vibration sensor (FN510-C/LN01), it is used for periodic condition monitoring of blowers and compressors and is attached to other equipment every few days to weeks. Since the WN 100 is a wireless device, it can be easily moved and installed in various places. Using sensors and devices with DTM mechanism on the same network, data comparison on the same time base becomes possible. With DTM technology applied, it can be used to install and monitor only for the period necessary for the judgment of normality and abnormality. Since the DTM runs on a PC, it is suitable for the use of data acquisition by connecting only for the necessary period. Thus, a packaged solution is an ideal system for condition-based monitoring.

Conclusion

The current packaged solution graphically displays the data received from the field. By comparing the value with the threshold value at the site, the user can judge the failure or abnormality. By accumulating these successful examples, we hope to further develop the system so that it can automatically determine abnormalities and failures, report signs, and predict the period until abnormalities occur. The packaged solution aims to contribute further to the safe operation of the plant for a long period of time by monitoring the condition of equipment in the plant when necessary and automatically detecting failures and abnormalities.



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