White Paper

NEW FDT2 SPECIFICATION PROVIDES ENHANCED SECURITY AND IMPROVED PERFORMANCE

OVERVIEW

FDT® Technology is an international technical standard developed to standardize the communication and configuration interface between smart field devices and their host systems by providing a common environment for access to the features of the smart devices. With over 5,500 devices supported by certified FDT DTM's and installations worldwide, FDT is recognized by standards organizations such as IEC 62453, ISA103, CENELEC and soon China GB/T.

The new FDT2™ standard is built on Microsoft .NET technology and incorporates a host of new features – several at the request of users. Enhancements to the standard have been done while maintaining full backward compatibility with previous versions, allowing end-users to make their own decision regarding the pace of migration to FDT2.

FDT2 standard includes many enhancements in several areas including security and improved performance. FDT2 provides users of both process and factory automation systems access to intelligent device and network information in a single, robust and field-proven environment.

FDT2 INTRODUCTION

The enhancements and development from FDT to FDT2 were driven by changing technology and user requirements. The challenges were to maintain all existing features and benefits, add new capabilities based on real world applications and enhance areas targetted for improvements. This development undertaking was done against a backdrop of maintaining backward compatibility in order to ensure investment protection of the installed base of device DTMs and Frame Applications.

FDT2 expands the amount of openness for use with a wide variety of field device types and with a wide selection of common communication protocols used in process and factory automation systems. It also needed to ensure and improve interoperability among devices and systems from many different suppliers while lowering the typical development and testing costs for new devices.

As a result of several years of work provided by FDT Group member companies, the FDT Specification was enhanced and approved by the membership. The new specification, FDT2, is now being implemented by many supplier companies in order to take advantage of the variety of new and valuable features integrated in the latest update.

The following overview of some of the enhancements included in FDT2 identifies how the specification has addressed the needs of users and suppliers.

MICROSOFT .NET

FDT2 uses a Microsoft .NET technology platform which enables fast and easy access to data while providing a stable platform for future enhancements. Microsoft .NET 4.0 is designed to be independent of hardware architectures and operating systems - including operating system changes initiated by Microsoft. As a result, a future-proof architecture concept for FDT2 was established based on the .NET technology platform which is based completely on open standards and specifications and offers all the properties needed by modern software including web and client/server based systems.

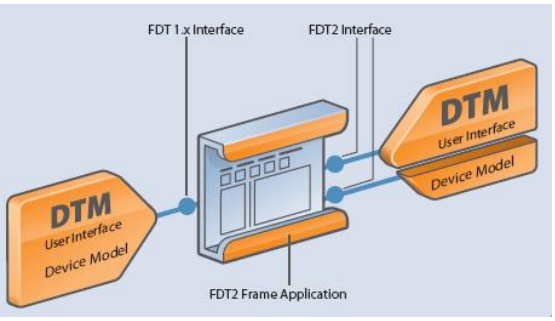
Also, all .NET versions are supported by .NET CLR. The CLR (Common Language Runtime) is the virtual machine component of Microsoft's .NET framework and is responsible for managing the execution of .NET programs. In a process known as Just-in-time compilation, the compiled code is converted into machine instructions that, in turn, are executed by the computer's CPU. The CLR provides additional services including memory management, type safety and exception handling. All programs written for the .NET framework, regardless of programming language, are executed by the CLR. It provides exception handling, garbage collection and thread management. CLR is common to all versions of the .NET framework. Microsoft also ensures full backward compatibility of CLR even if they release future versions.

A critical point for this change is the backward compatibility of .NET with older Microsoft technologies. For example, .NET can use “older” software like COM/ActiveX components and it is even possible to develop such components with .NET. The compatibility also functions in both directions. These advantages have led to .NET finding applications in many industrial areas. .NET has already been used in applications based on older versions of FDT software. Consequently, the further development of COM/ActiveX® migrating to .NET is a natural evolutionary step for FDT.

DTM AND FRAME APPLICATIONS

The primary components of FDT2 remain the same – the DTM and the Frame Application. DTMs are used by a Frame Application (think of a single web browser consistently displaying many different websites) to enable total device information and parameter access - independent of supplier, network protocol or control system.

The DTM architecture in the new standard has been split into two sections with one section being the graphical user interface and the other section being the device model or business logic – making the DTM easier to work with. The rich User Interface includes a graphical representation of device parameters and suppliers are also free to include their own device wizards and other diagnostics tools. The graphical user interface does not speak directly to the business logic which is now handled by the Frame Application.



With the graphical user interface now logically separate from the business logic, it creates a fairly lightweight client which can be distributed throughout the facility when producing client server architectures. With this distributed architecture, users can update a DTM on only one server PC which can then automatically update all client PC on the network. The DTM on the server can then be automatically updated when a new version is released with security provided by an authenticated signature.

The interoperability between existing DTMs and newer FDT2 DTMs is safeguarded in the new specification. Therefore, FDT2 DTMs and existing DTMs are both fully supported by every Frame Application developed according to the FDT2 specification - ensuring backward compatibility.

SECURITY ENHANCEMENTS

The topic of security in the sense of access and tamper-proof protection is becoming more significant in the software industry. With industrial software, system stability and security is very important. This security risk in the industrial automation industry is generally mitigated through the IT infrastructure and robust IT guidelines. This approach to stable and secure applications applies to FDT2 in two ways: all applications created in compliance with FDT2 specifications are digitally signed providing non-repudiation and making them tamper proof. And, there is more granular DTM security with enhanced user rights and privileges added to the security settings. The predefined levels of security have been replaced with a user-defined capability which allows the user to define who can have access to certain items – putting the level of security into the hands of the user.

The FDT Group has set up a certification process for DTMs regarding their FDT2 compliance. Certified DTMs contain an embedded digitally signed certificate from the FDT Group. The Frame Application can ensure the integrity of the DTM (through signed certificates) and can also display the certificate, or lack of, issued and signed by the FDT Group. These certificates are tamper proof and cannot be forged due to the cryptography technology involved. This process ensures the validity of the certificate as it can check the signature by means of the corresponding key assigned to the FDT Group. Both methods together grant a high degree of security in the use of DTMs.

INCREASED PERFORMANCE

The FDT2 standard also benefits from speed and performance improvements. It includes more granular data for faster data storage. It is now possible to undertake static functions due to the separation of the business logic (or device model) and the graphical user interface. It is also possible to run the business logic without starting the DTM. This allows the server to be used for other tasks such as asset management applications, without showing any graphics from the DTM.

Device parameters are now divided into data blocks and can be dynamically loaded during use. One instance does not have to immediately upload the entire data record of a DTM. The DTM is initially started by accessing only the data and parameters of the DTM User Interface. Only if the user calls up additional user interfaces will the additional data records be loaded. This advantage is especially apparent in FDT2 Frame Application projects using many DTMs.

COMMON COMPONENTS

FDT2 includes a set of Common Components that provide a supplier with the software components needed to quickly and efficiently implement the FDT2 specification. Their use enables suppliers to immediately start developing FDT2 products while maintaining backwards compatibility to previous versions of the standard. Products which incorporate the Common Components make it through the testing and certification process much more quickly because the testing of the components has already been done. This enables a quicker product development time and allows suppliers the ability to focus on the value-added features of their own product rather than on new software code.

Common Components are available for both DTM as well as Frame Application development. These Common Components have been developed and tested together, to ensure interoperability and compliance with the FDT2 standard. As a result, this increases the interoperability of DTMs and Frame Applications supplied by a variety of different suppliers.

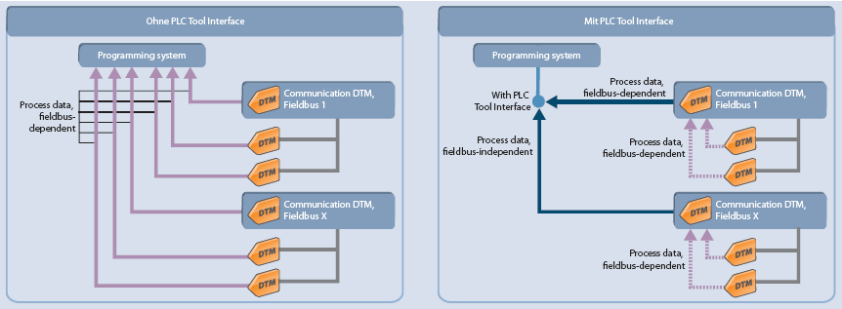
FACTORY AUTOMATION READY

FDT Technology is used primarily for the integration and configuration of field devices in controllers, control systems or plant asset management systems. The PLC programming system accesses the devices or their DTMs via its Frame Application. FDT2 is designed to deliver standardized access to industrial automation products such as robots, servos, drives, valve manifolds, digital and analog IO modules, temperature controllers, mass flow controllers, bar code & RFID readers and many others.

FDT supports a multitude of bus types in factory automation and a large number of various fieldbus and Ethernet protocols. Because FDT is suitable for all communication protocols including discrete and sensor buses, end users have the flexibility to include discrete assets in their automation systems. Several factory automation protocols are currently supported in the FDT specification including; CC-Link, DeviceNet, ControlNet, EtherNet/IP, IO-Link, Modbus, PROFINET, Sercos, and others.

Users have also requested that process device measurements be integrated so that these can be processed by the PLC system using all fieldbus protocols in a similar way. The process data provided by the device DTMs consist of a fieldbus-specific format. However, in the past, no standardized description of these measurements existed in a fieldbus-neutral form making uniform signal processing possible. Users also requested the physical as well as the logical network layout be available to them using their selected communication protocol.

This network–independent integration of automation measurements and values is made possible through the definition of additional FDT interfaces and data types of a communication



DTM, representing the network master, to form a neutral description of the automation measurements. This innovation allows a consistent and uniform display of automation data from different networks and the assignment of the data types defined by IEC 61131. The result is a complete system for the integration of different networks and devices from different manufacturers. The network independent and standardized use of I/O signals in the PLC is a huge step forward for both the user as well as the providers of such systems.

BACKWARD COMPATIBILITY

Aspects of the plant's life cycle on device integration in systems are an integral part of FDT Technology. In FDT2, this topic is dealt with by means of various definitions and guidelines. An example is the implementation of a device exchange with the accompanying update of the DTM. This is a function that is handled as a special case in FDT2. The required backward compatibility of FDT2 to all previous versions of FDT is ensured by the FDT2 specification and by the manufacturers – protecting the installed investment. Consequently, every Frame Application developed according to the FDT2 specification ensures this backward compatibility. This means that FDT2 DTMs and FDT DTMs are interoperable and fully supported.

All protocols currently supporting FDT Technology will also work with FDT2. In addition, there are a few more protocols being planned including the ISA 100.11a wireless protocol with an annex expected later in 2013.

FDT, OPC AND FDI – INTO THE FUTURE

The planned inclusion of an OPC UA information model to be released in the near future will provide online data exchange between automation systems, asset management systems, and other plant and enterprise systems and applications. OPC UA Technology uses a service-oriented architecture (SOA) that runs on Windows PCs, Linux, and other enterprise-level systems. By integrating FDT and OPC, users will be able to use OPC UA applications to send data to business systems, enhancing the reliability of asset information and providing a comprehensive view of asset situations that may require attention.

The FDT Group is also working with other field communication organizations to develop the new FDI (Field Device Integration) standard. The future FDI standard seeks to couple the use of electronic device descriptions (EDDs) with a graphical interface into a new industry standard.

The FDT Group and the other members of the FDI Cooperation, LLC, are working in tandem to ensure future interoperability. Therefore, FDI Device Packages will fully operate on an FDT2 Frame Application along with existing FDT and new FDT2 DTMs. End users adopting FDT and FDT2 will have a substantial lead over their peers by being able to develop new work processes now that deliver maximum value from their FDT-based asset management programs - eliminating the need to wait for FDI implementations.

For more information on FDI, see our White Paper:
FDT2 Architecture Integrating FDI Device Packages
http://www.fdtgroup.org/sites/default/files/pages/1303_FDI_Whitepaper_FINAL_R2.pdf

CONCLUSION

In addition to enhanced security and improved performance, FDT2 provides users of both process and factory automation systems access to intelligent device and network information in a single, robust and field-proven environment. Backward compatibility protects the installed assets while FDT2 enhancements can be added.

FDT and FDT2 Technology are independent of field devices version (for example, firmware or hardware) and can therefore be used universally for every device that is enabled with a communications interface. The communication protocol supported by the device and the device capabilities are completely integrated by the FDT Technology software on PCs, DCS, PLCs or other automation systems.

As a result, new plants may be equipped with and benefit from FDT Technology but it can also be added and used at existing facilities. When retrofitting an existing system, no modification or replacement of the installed field devices is required. The existing networks or bus systems, communications facilities, and field devices may be used without change. In order to benefit from the value offered by FDT Technology, the corresponding DTMs must simply be installed in an FDT Frame Application.

To learn how to get started, please review our White Paper: "***Specifying FDT Technology – Putting Your Assets to Work***!" at www.fdtgroup.org/specwp.

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