FDI Technology

DIGITAL TRANSFORMATION THROUGH FIELD DEVICE INTEGRATION

ONE device – ONE package – ALL tools

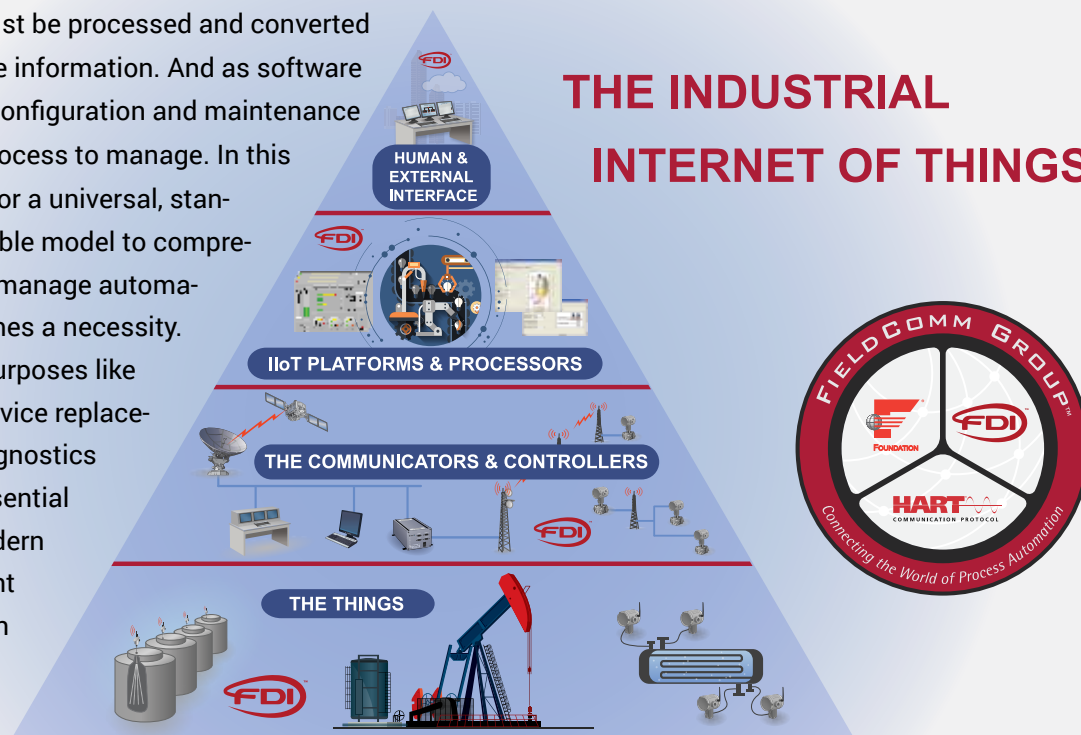# INTEROPERABILITY: THE KEY TO DIGITAL TRANSFORMATION

Value Creation Through Integrating Intelligent Field Devices in Automation Solutions

Many of today's field devices function more like embedded computers than transmitters of physical process values. They are intelligent, microprocessor based devices that offer a wealth of data not previously available. They are connected via sophisticated communication networks to complex control systems and beyond. And they generate much more data about both the process being managed and their own status than ever before. But taking advantage of this data is a challenge. First, the data must be made accessible to multiple plant floor and enterprise IT systems. Then, data must be processed and converted to actionable and visible information. And as software and systems upgrade, configuration and maintenance becomes an ongoing process to manage. In this environment, the need for a universal, standardized and interoperable model to comprehensively describe and manage automation components becomes a necessity. It is vital for everyday purposes like device configuration, device replacement, maintenance, diagnostics and audit trails – all essential building blocks in a modern field device management system. This description must be usable for all systems, independent

of suppliers of devices, systems or tools. Without it, the true potential of decentralization, transparency, integration and a central view of all data and functions cannot be fully realized.

> **Digital Transformation:**
> The act of leveraging digital connectivity, scalability, analytics, and re-imagined business processes to dramatically improve operational efficiency, safety, and value creation.
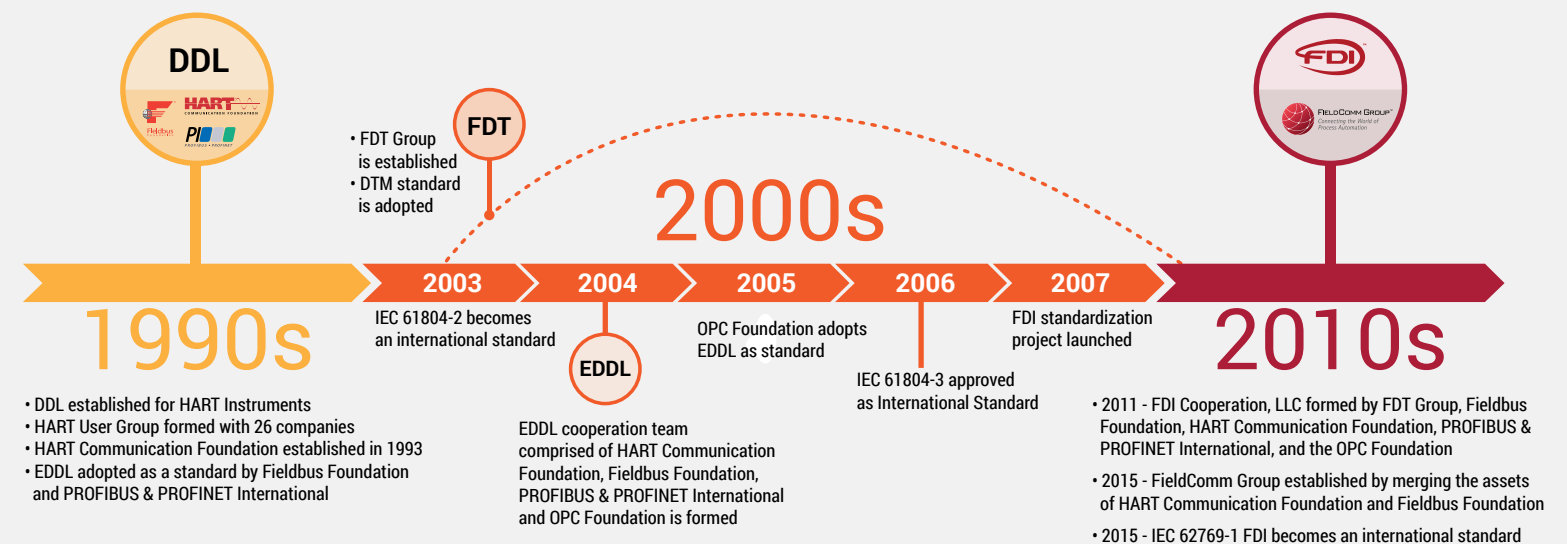
THE INDUSTRIAL INTERNET OF THINGS

HUMAN & EXTERNAL INTERFACE

IIoT PLATFORMS & PROCESSORS

THE COMMUNICATORS & CONTROLLERS

THE THINGS

Field Device Integration Technology (FDI) – Evolution Rather Than Revolution

The roots of FDI technology date back to the 1980s, when Device Descriptions first became popular. As both device and system technology became increasingly complex, Devices Descriptions and the tools used to create them evolved to incorporate more and more sophisticated features. Windows-based FDT/DTM architecture diverged from text based EDDL designs. System suppliers generally support one architecture or the other. Devices vendors are forced to support both.

End users began demanding a single solution as procurement, configuration and maintenance costs escalated. So in 2007 the FDI standardization project was launched to carefully shape convergence of FDT/DTM and EDDL architectures.

In 2011 a non-profit organization, the FDI Cooperation LLC, was created to manage the standardization process for a converged device integration technology. In 2015, after being standardized as IEC 62769-1, the FDI Cooperation transferred ownership, management and enhancement of the standard to FieldComm Group and PROFIBUS & PROFINET International.

FDI Cooperation

Fieldbus Foundation

FDT Group

HART COMMUNICATION FOUNDATION

OPC FOUNDATION

PI · PROFIBUS · PROFINET

Timeline

DDL

1990s
- DDL established for HART Instruments
- HART User Group formed with 26 companies
- HART Communication Foundation established in 1993
- EDDL adopted as a standard by Fieldbus Foundation and PROFIBUS & PROFINET International

FDT
- FDT Group is established
- DTM standard is adopted

2000s

2003 — IEC 61804-2 becomes an international standard

2004 — **EDDL** — EDDL cooperation team comprised of HART Communication Foundation, Fieldbus Foundation, PROFIBUS & PROFINET International and OPC Foundation is formed

2005 — OPC Foundation adopts EDDL as standard

2006 — IEC 61804-3 approved as International Standard

2007 — FDI standardization project launched

2010s
- 2011 - FDI Cooperation, LLC formed by FDT Group, Fieldbus Foundation, HART Communication Foundation, PROFIBUS & PROFINET International, and the OPC Foundation
- 2015 - FieldComm Group established by merging the assets of HART Communication Foundation and Fieldbus Foundation
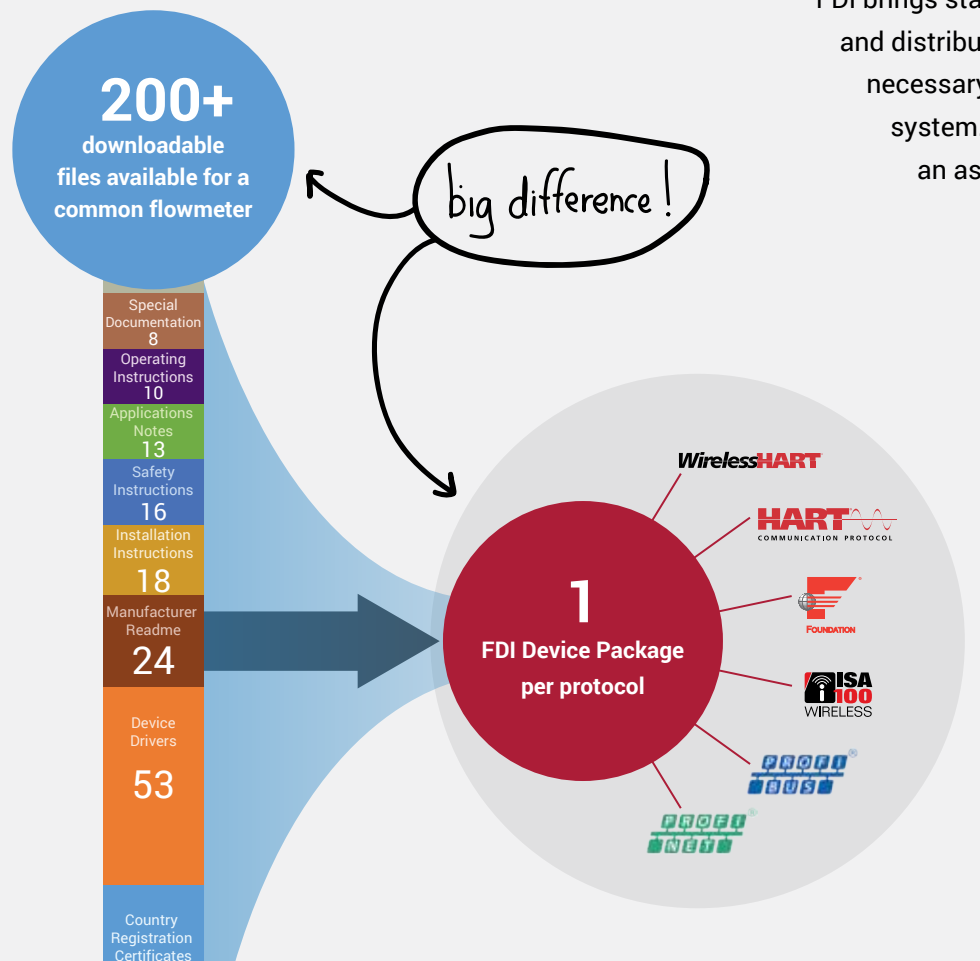- 2015 - IEC 62769-1 FDI becomes an international standard

STRESS-FREE INTEGRATION

The primary objective of FDI is to dramatically simplify software installation, configuration, maintenance, and management of field instruments and host systems. Today's field devices often include a device information file such as an EDD or a DTM that provides software access to the features and functions of the device, one or more user interface plug-ins that integrate with host system software to enhance usability of the field device with the host, numerous user manuals, installation instructions and data sheets.
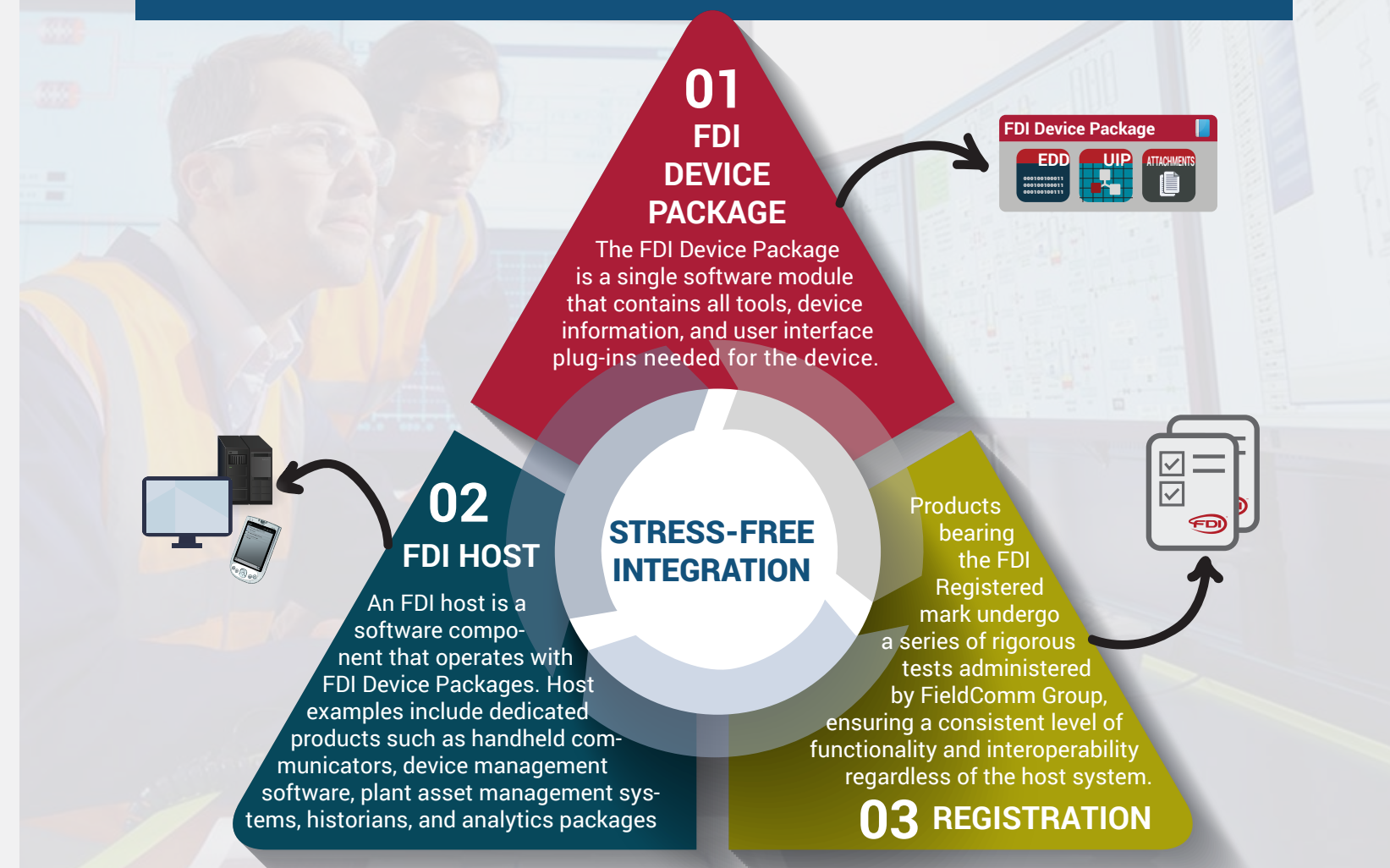
FDI brings standardization to the packaging and distribution of all the software and tools necessary to integrate a device with a host system. All registered FDI devices will have an associated FDI Device Package.

Before FDI

200+ downloadable files available for a common flowmeter

big difference !

Special Documentation	8
Operating Instructions	10
Applications Notes	13
Safety Instructions	16
Installation Instructions	18
Manufacturer Readme	24
Device Drivers	53
Country Registration Certificates	62

1 FDI Device Package per protocol

WirelessHART
HART COMMUNICATION PROTOCOL
FOUNDATION
ISA 100 WIRELESS
PROFIBUS
PROFINET

FDI

ONE Device – ONE Package – ALL Tools

FDI Device Packages + Hosts + Registration = Stress Free Integration

01 FDI DEVICE PACKAGE
The FDI Device Package is a single software module that contains all tools, device information, and user interface plug-ins needed for the device.

FDI Device Package
EDD UIP ATTACHMENTS

STRESS-FREE INTEGRATION

02 FDI HOST
An FDI host is a software component that operates with FDI Device Packages. Host examples include dedicated products such as handheld communicators, device management software, plant asset management systems, historians, and analytics packages

03 REGISTRATION
Products bearing the FDI Registered mark undergo a series of rigorous tests administered by FieldComm Group, ensuring a consistent level of functionality and interoperability regardless of the host system.
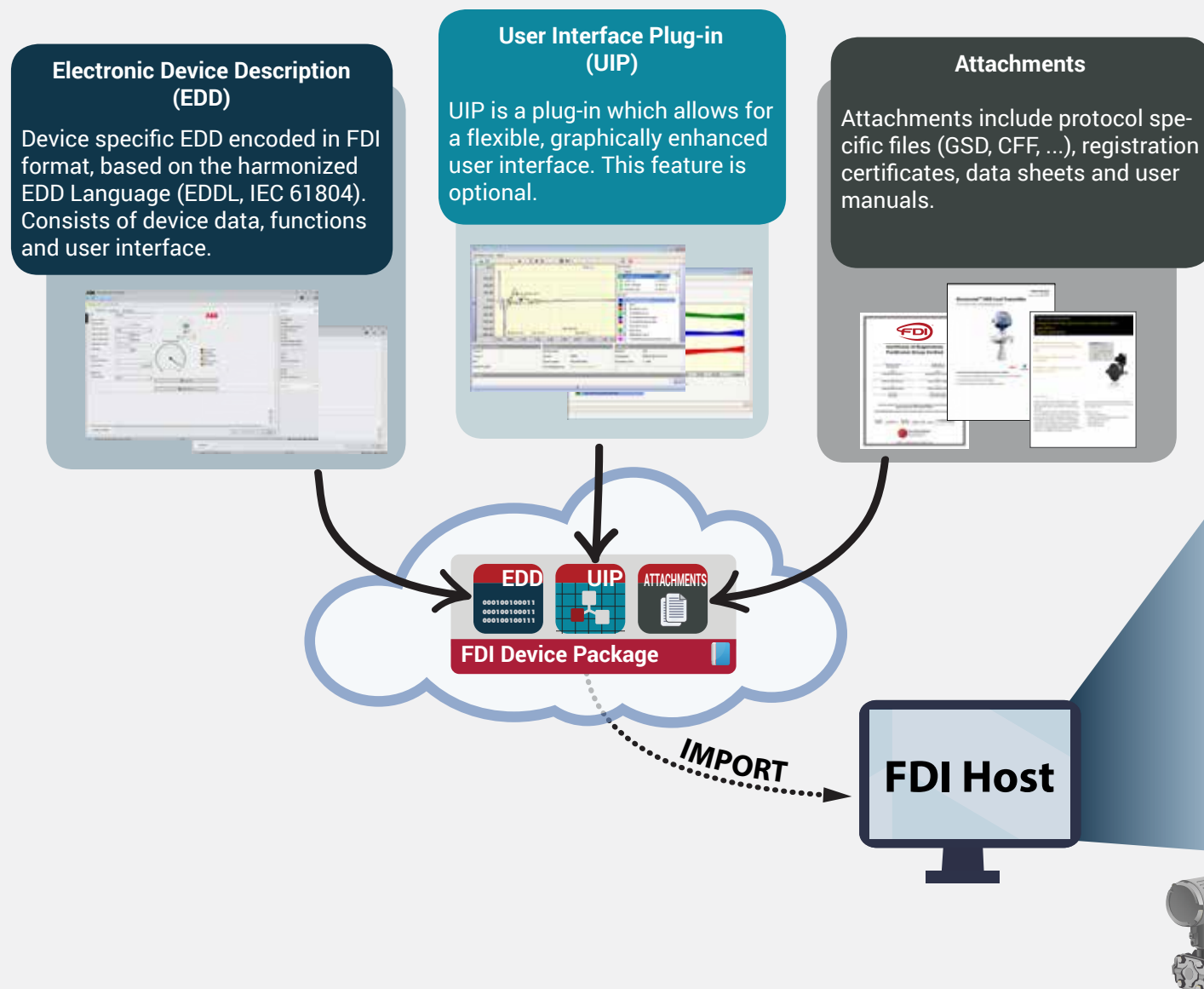
FDI is a system-wide solution. Host systems, like asset management systems, configurators, and device managers must support the FDI client-server architecture. Field device suppliers must encapsulate device specific software and documentation into an FDI Device Package. Finally, product registration service providers, like FieldComm Group, must deliver high quality conformance testing, registration, and FDI Device Package distribution services. When host systems, FDI Device Packages, and high-quality registration are combined, end users can take advantage of a truly stress free device integration solution.

FDI DEVICE PACKAGE + FDI HOST = A PERFECT TEAM

## FDI DEVICE PACKAGES - THE CORE OF FDI

The FDI Device Package is the core component of an FDI enabled system. An FDI Device Package is a single file that includes drivers, interfaces, certificates and documentation.

Electronic Device Description (EDD)

Device specific EDD encoded in FDI format, based on the harmonized EDD Language (EDDL, IEC 61804). Consists of device data, functions and user interface.

User Interface Plug-in (UIP)

UIP is a plug-in which allows for a flexible, graphically enhanced user interface. This feature is optional.

Attachments

Attachments include protocol specific files (GSD, CFF, ...), registration certificates, data sheets and user manuals.

EDD **UIP** **ATTACHMENTS**
000100100011
000100100011
000100100011
FDI Device Package

IMPORT

FDI Host

FDI HOSTS

FDI Device Packages are imported by FDI hosts, allowing users to operate the device. An FDI host can be a stand alone software component, an integrated software component in a distributed control system or a software component with a client server architecture. FDI host examples include dedicated products such as handheld field communicators, standard software components of a distributed control system like the device management software or optional software systems such as plant asset management systems, historians, and analytics packages.

An FDI host typically consists of an FDI client, an FDI server and one or more FDI communication servers.

FDI Client
UI Engine

FDI Server
Information Model
EDD Engine

Communication Server
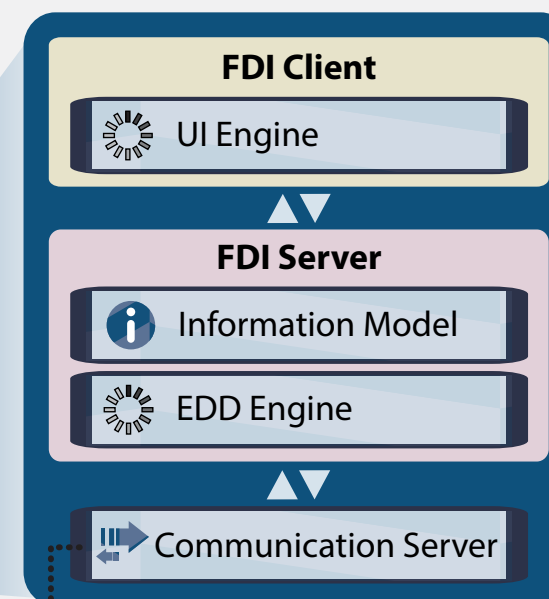
The UI Engine ensures that user interface elements of the FDI Device Package, the UID and UIP, are executed in the same way in various host systems.

An Information Model interacts with Device Model Services (included in FDI Common Host Components) which retrieves EDD information from the EDD Engine.

The EDD Engine supports the entire scope of EDDL in a multiprotocol manner, in accordance with IEC 61804. It is backward compatible with existing EDD formats.

The Communication Server natively supports standard protocols like HART, PROFIBUS, PROFINET and FOUNDATION Fieldbus. Additional communication paths can be integrated by communication servers, for example, an OPC UA communication server.

# FORWARD FOCUSED
BACKWARD COMPATIBLE

Millions of devices worldwide are currently installed, configured, operated, managed, and maintained by control systems and tools that support either the EDDL or FDT standards.

Any convergence standard must acknowledge the installed base, be designed for flawless interoperability and provide a seamless, scalable and standardized approach to accessing data. FDI technology meets the challenge. It is designed to support FDI Device Packages as well as DTMs and EDDs in parallel.

FDT tool supporting FDI

One way to enable an FDT host to support FDI Device Packages is to through an FDI-DTM. In this system an ability to process an FDI Device Package is added while components like user interface and communication interfaces remain unchanged.
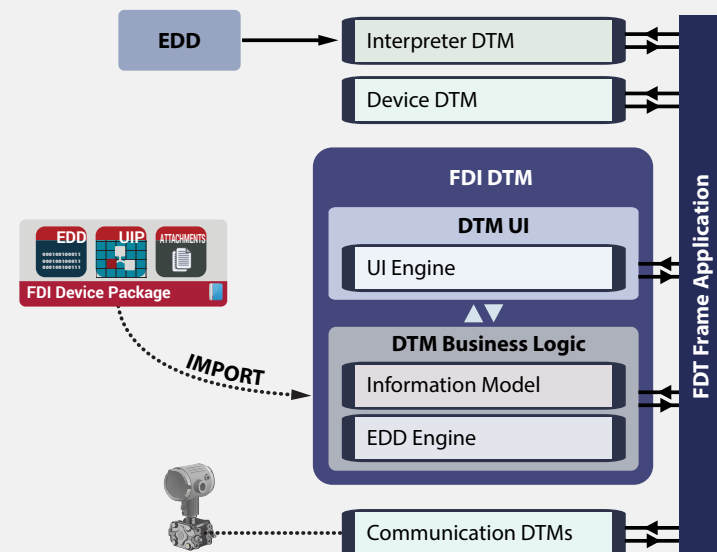
FDI hosts support existing EDDs

Existing EDDs may be processed by FDI hosts.
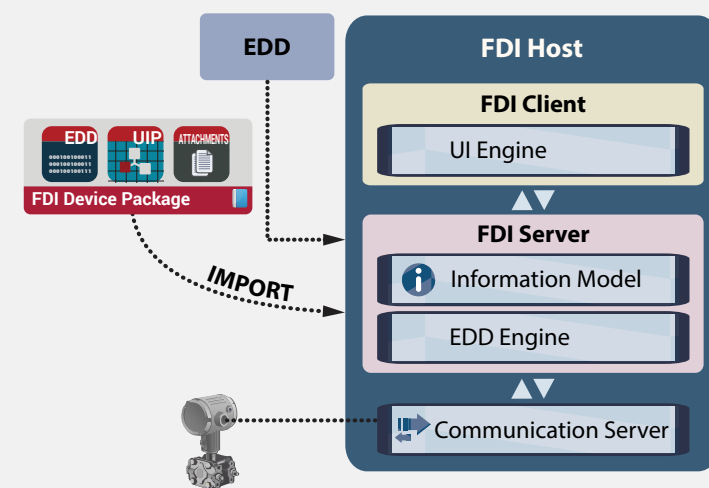
Migration of new standards

EDDL has been standardized and harmonized, but new innovations and market requirements will continue to drive changes to the EDDL standard. FDI manages such innovations very easily and is designed to accommodate such changes. For example, the FDI Common Host Components may be updated to incorporate these changes and provide access to new functionality while guaranteeing backward compatibility. After integration of these new components in an FDI host by the host supplier, the new standard is supported and the user can enjoy the benefit of the innovation.

great tool!

INTEROPERABILITY

EASE OF USE FOR SYSTEM ADMINS

EASE OF USE FOR USERS

MIGRATION AND INVESTMENT PROTECTION

ROBUSTNESS

FDI Device Package

ROBUSTNESS
FDI Device Packages do not impact system's robustness • FDI Device Packages are not programs which have to be installed • An FDI Device Package for one device type does not impact devices already integrated

EASY OF USE FOR USERS
FDI provides the same look and feel for all devices • FDI hosts can support FDI Device Packages for HART, FOUNDATION Fieldbus, PROFIBUS, PROFINET and other protocols

INVESTMENT PROTECTION
New version of FDI hosts must be compatible with older versions of FDI Device Packages • FDI host may support existing EDD and FDT based hosts

EASE OF USE FOR SYSTEM ADMINS
An optional OPC UA communication server can be used for connecting to ERP and MES systems • No software in-stallation is required when an FDI Device Package is imported by the FDI host

INTEROPERABILITY
FieldComm Group performs conformance tests for FDI Device Packages and hosts to ensure interoperability • Software components for the FDI host are standardized • An FDI Device Package uses harmonized EDDL compatible with the FDI standard host components

INDUSTRY LEADERS SUPPORT FDI

NAMUR — Standardized, intelligent interfaces are the key success factor in achieving the benefits of Industrie 4.0 in process industry. They are the basis for making our core processes, supply chain and asset life cycle as well as "vertical" integration more transparent and efficient. FDI is a big step in the process of integrating field devices into automation systems with standardized, vendor independent tools and procedures. FDI simplifies the tasks of automation engineers, avoiding manual integration and therefore aids in saving money and fostering safety and availability. NAMUR as a user association of automation technology has driven activities to merge existing standards and tools and will promote and implement FDI.

- Dr. Wilhelm Otten, President

ABB — For ABB, FDI is the key technology to overcome the ever repeating efforts for integrating field devices into control systems and asset optimization tools. It will help end users to take advantage of devices' functionality more effectively and efficiently than ever before. In addition, FDI is the migration path for traditional field instruments into the Internet of Things, Services and People. Thus, ABB started product implementation early and released the first FDI-based product, Field Information Manager, in mid 2015. In three minutes time users can start managing their devices using this product. The second version of the product is now available, providing additional functions for easy device management and supporting the use on handhelds.

- Thoralf Schulz, Global Technology Manager

EMERSON Process Management — Moving to a single technology for the configuration, maintenance, alert visualization, and data access of smart field equipment is an imperative for the automation industry. This will provide a reduction of tools, cost savings, consistent interfaces, and ease of use for both manufacturers and end users. FDI has incorporated all the best capabilities of the approaches that have been used before in this area, moved them to the latest technologies, added new features, and is ready to fulfill this role. Emerson is fully committed to implementing FDI technology across our portfolio.

- Peter Zornio, Chief Strategic Officer

Endress+Hauser People for Process Automation — Our customers are demanding an integration technology, which can fulfill their need for reduced life-cycle cost of field devices, from installation to replacement. Seamless interoperability and data transparency on all levels are key factors in customer acceptance of upcoming technologies. As an FDI pioneer, Endress+Hauser has supported customers from the first specification, leading up to the first implementation of the technology for field instruments. Endress+Hauser is committed to serve customers with the latest integration technology and bring them the best possible value.

- Dr. Rolf Birkhofer, Managing Director

Honeywell — Honeywell Process Solutions is a charter member of the effort to reconcile differing device integration methods into a unified approach - FDI. The value of FDI is especially realized by end-users, in that devices across the spectrum of industrial standards such as HART, FOUNDATION Fieldbus, and PROFIBUS can be engineered and maintained with a common, system and device independent, set of tools. Equally important, FDI marries the simplicity and platform independence of EDDL with the powerful functionality of FDT, in a secure manner, providing the end user with an open, future-proof standard for integration and superior user experience. Honeywell actively plans uniform adoption of FDI in its SmartLine instruments, Experion® DCS and its Field Device Manager asset management suite.

- Paul McLaughlin, Chief Engineer

SIEMENS — As a complete supplier of host systems and field devices, Siemens has always played a pioneer role in the development of FDI. The Process Device Manager Simatic PDM was our first prototype utilizing FDI functionality. This tool already worked with FDI Device Packages in 2013. Siemens will release the first FDI host system and corresponding FDI Device Packages in 2017. We consider FDI as a decisive step towards less complexity and optimized customer service and will continue to strengthen the joint activities accordingly.

- Axel Lorenz, Vice President, Process Automation

YOKOGAWA — Yokogawa has played a key role in the development of FDI technology, from specification to design, including development of its Integrated Development Environment (IDE). Our contributions include the creation of the first sample FDI Device Package in 2014. We also led the development of the Reference Run Time Environment (RRTE) for FDI hosts. Based on market demand, Yokogawa is co-innovating with its customers to develop and release FDI-compatible versions of host systems such as the FieldMate device management tool and Plant Resource Manager (PRM), as well as FDI Device Packages.

- Shinji Oda, Chief Standards Officer & General Manager for Technology Marketing

Glossary

Field Device Integration (FDI)
Device integration and device management technology, combining base concepts and technology aspects of Electronic Device Description Language (EDDL), Field Device Tool (FDT®2), and OPC UA.

FDI Device Package
A collection of software components that provide all the information necessary to integrate a type of design into a system.

FDI Server
A host system software component that implements the Information Model, executes Business Logic, and communicates with devices.

Business Logic
Descriptive element of an FDI Device Package that specifies device behavior and mapping logic for communication.

FDI Client
A host software component that uses the Information Model, interprets User Interface Descriptions and hosts User Interface Plug-ins

Information Model
Set of objects, variables and methods rendered by an FDI Server

User Interface Description (UID)
Descriptive element of and FDI Device Package that is used by an FDI Client to render user interfaces.

User Interface Plug-In (UIP)
Executable element of an FDI Device Package executed by an FDI Client

FDI Communications Server
An OPC-UA server used by and FDI Server to access non-native networks.

About FieldComm Group

FIELDCOMM GROUP™ Connecting the World of Process Automation

FieldComm Group is a global standards-based organization consisting of leading process end users, manufacturers, universities and research organizations that work together to direct the development, incorporation and implementation of new and overlapping technologies and serves as the source for FDI technology.

FieldComm Group's mission is to develop, manage and promote global standards for integrating digital devices into automation system architectures while protecting process-automation investments in HART and FOUNDATION Fieldbus communication technologies.

Membership is open to anyone interested in the use of the technologies. For more information, visit our website fieldcommgroup.org.

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