

Fieldbus 201

Fieldbus Interoperability

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Overview

Can I use fieldbus products from different suppliers?

The whole point of having an interoperable fieldbus is being able to use fieldbus products from different suppliers — and have them work as they were designed. That's been the prime directive of the Fieldbus Foundation since day one.

Freedom of choice. The architects of the Fieldbus Foundation realized years ago that one of the greatest limitations to proprietary technology and "closed" plant automation systems was that the end user often became "locked in" to a single supplier's products. For users in this situation, implementing the best technology often wasn't an option. The interoperability of FOUNDATION fieldbus, on the other hand, makes these constraints a thing of the past.

This course will help you understand fieldbus interoperability.

Hint: As you go through the topics in this course, watch for answers to these questions:

- *How does the Fieldbus Foundation define interoperability?*

- *Who conducts interoperability tests?*
- *Are host systems certified for interoperability?*

What is interoperability

The Fieldbus Foundation defines interoperability as "**the ability to operate multiple devices, independent of manufacturer, in the same system, without loss of functionality.**"

The term **multiple devices** refers to a set of fieldbus products that may include a mix of field devices such as valves and transmitters, and host devices such as control systems.

Independent of manufacturer means vendor independence. That is, having the freedom to choose the best technology for the task, regardless of which vendor makes the product.

In the same system means within the mix of control equipment that operates as a single automation solution. There are, of course, guidelines for the number and type of devices that should be combined together within individual segments of the fieldbus network, primarily for electrical and intrinsic safety purposes. We'll get into this topic later in the course.

Without loss of functionality means the devices operate without the loss of any of their designed features. That is, being part of an interoperable network doesn't interfere with any of their functions.

In the next section, we'll look specifically at interoperability between field devices.

The PlantWeb advantage

Interoperability is a key feature of PlantWeb field-based architecture from Emerson Process Management.

- Emerson has the world's largest number of interoperable field device types
- Emerson has over 4 years run-time of PlantWeb field devices with other suppliers' host systems, and of other suppliers' field devices with a PlantWeb host system.
- PlantWeb supports over 60 devices from other suppliers. New device types are quick and easy to add.
- PlantWeb's DeltaV automation system was among the first hosts to pass host interoperability testing.



Field device interoperability

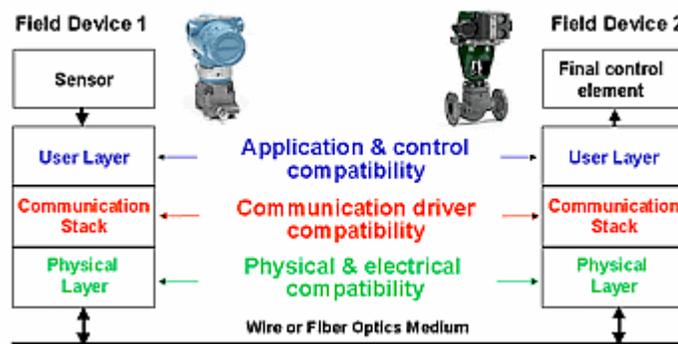
Interoperability between field devices basically means that field devices from different manufacturers can work together, sending and receiving information related to their specific function in the process.

The Fieldbus Foundation has established guidelines for interoperability between field devices on a fieldbus segment. These guidelines address different aspects of device interoperability such as physical characteristics, communication, and software functionality.

To be truly interoperable, devices must

- Be physically and electrically compatible with the fieldbus segment (as defined by the ISA 50.02-2 Physical Layer Specification).
- Include a communication stack that passes the Fieldbus Foundation's Stack Conformance Test.
- Correctly implement the Function Block Application Process Model defined in the FOUNDATION fieldbus specification. This means a device's function blocks must interconnect and interoperate with the function blocks of other devices on the network.

The figure below illustrates interoperability requirements.



Testing devices for interoperability

Interoperability testing, using a prescribed set of consistent and rigorous test procedures, helps ensure that all devices will operate together.

The Fieldbus Foundation has established two tests for this purpose: the Stack Conformance Test and the Device Interoperability Test.

The **Stack Conformance Test** ensures that the device interfaces correctly with the bus; that is, electrical characteristics and bus access are consistent with the fieldbus specification.

The **Device Interoperability Test** ensures that the device's function blocks will interact with other blocks correctly, and will provide accurate information and mode behavior.

These tests are continuously enhanced based on actual field experience. This means that all tested devices receive the maximum benefit of the features available in FOUNDATION fieldbus.

When a device has successfully completed these interoperability tests, it is recognized as a registered device and can bear the Fieldbus Foundation's interoperability "checkmark" logo.



A list of registered devices can be found on the Fieldbus Foundation's web site at www.fieldbus.org.

The PlantWeb advantage

Emerson Process Management wants to make sure our products will be highly reliable in your plant environment. That's why we go beyond standard interoperability testing to include real-world stress testing of other suppliers' fieldbus devices with our host system, and other suppliers' host systems with our devices.



Some of our tests include:

- Segments with a large number of different device types from different vendors operating continuously for long periods of time
- Segments with very heavy message loading
- Segments with high device count, maximum segment or spur length, and minimum voltage conditions at some nodes

Not all suppliers do testing with multi-vendor test beds. Emerson Process Management does.

When device capabilities evolve

FOUNDATION fieldbus allows suppliers to enhance and differentiate their products while maintaining the interoperability users want.

Adding blocks. A device is registered for the defined set of blocks tested during the Fieldbus Foundation's interoperability test. If a supplier adds additional blocks to the same device, the device may be retested and reregistered for the additional blocks.

Alternatively, the supplier can offer the blocks as unregistered functionality. In some cases, that may be the only option -- no function block type can be registered unless at least two suppliers offer the block in their products, and both products pass interoperability testing for that block type.

Devices may also be retested and registered following other changes, such as firmware revisions.

Different capabilities. Bear in mind that the interoperability test determines interoperability, not functionality. The internal operation of a device's control algorithms is determined by the manufacturer. Registered devices can work quite efficiently with each other on the network, but exhibit different behavior due to varying control algorithm characteristics.

Host system interoperability

In most cases, a **host system** is used to configure fieldbus devices, set up the control strategy, and display all information available from the field devices. The host system may also participate with field devices in providing process control.

To do all this, the host system must be able to access, use, and display FOUNDATION fieldbus data from all devices involved. The **Host Interoperability Support Test (HIST)**, consisting of 18 separate tests, shows how well a host system interoperates with specific standard capabilities of FOUNDATION fieldbus devices.

Although field-device testing is mandatory, host testing is optional. A host can undergo none, some, or all of these tests to demonstrate its support for specific functions.

Understandably, the HIST doesn't cover proprietary capabilities that suppliers may add to their products. However, it's still possible for a host to access those capabilities if the device supplier provides a Device Description (DD) and if the host includes DD Services to read it.

In short, the HIST ensures that the host is a good citizen on the fieldbus segment, but not that it will access, display, or use device information completely or to its best advantage.

Unlike field devices, host systems are not actually certified. However, the Fieldbus Foundation lists on their web site the tests each host has passed. The DeltaV system that's part of PlantWeb architecture was among the first to be listed.

Off-line interoperability

Up to this point we've focused on "on-line" interoperability, where field devices are physically connected to the host system as they are being configured. Quite often, however, field devices are not available at the time configuration is being done by the host system.

Capabilities files. To help solve this dilemma, the Fieldbus Foundation has issued a Common File Format specification which defines a **Capabilities File** that can be used to describe information about a fieldbus device that would normally only be available by reading it from the device itself.

An interoperable host system that supports off-line configuration uses this Capabilities File, along with the Device Description, to build an offline configuration of the field devices.

Capabilities files are provided by the device manufacturer and are available for download from the Fieldbus Foundation website.

Any-time configuration. Off-line interoperability allows those doing configuration, such as engineering and consulting firms, the capability to configure an entire fieldbus network—off line. This means that much of the engineering for a FOUNDATION fieldbus network, including configuration of the devices and control strategy, can be accomplished prior to acquisition of the actual devices.

For this to happen, each device supplier must provide Capabilities Files and Device Descriptions for its devices. In addition, the host system supplier must support off-line configuration using information from the device Capabilities Files.