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HIST and its Affect on Fieldbus

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Abstract

The Host Interoperability System Test (HIST) standard was approved by the Fieldbus Foundation in August 2000. As with any new standard, many questions related to its purpose and use such as:

- What is it for?
- When should it be used?
- How will it affect the way business is done? and
- Where should it be applied?

Need to be answered. This paper will answer these questions while also describing how industry, both users and manufacturers will use and benefit from the HIST standard.

What is HIST?

The Host Interoperability System Test is a suite of procedures and test cases used to verify that a host system is capable of supporting the full suite of features Foundation Fieldbus provides. The test itself is voluntary and once passed does not provide a host certification 'check mark' similar to that used for devices. Hosts, that participate in the test receive instead a 'letter of compliance' indicating which parts of the test suite they completed successfully.

Only registered devices and equipment using registered stacks are eligible to participate in the HIST. When submitted for testing, the following items are checked:¹

- Initial Connection and Address Assignment
- Reading and Writing of Field Device Information
- Test of configuration of link objects and link establishment

- Testing of Mode and Status
 - Testing of Alarms and Events
 - Testing of View and Trend Objects
 - Testing of Block Specific Behaviour
 - Testing of the Device Description
- and
- Testing of the Capabilities File

The host system supplier defines which of the above functions are supported and therefore should be tested. At present all tests are performed at the Fieldbus offices in Austin, Texas though the potential to have the manufacturers 'self-test' is being considered once more experience has been obtained.

The tests themselves use at least four registered devices, none of which are from the same manufacturer as the host, one host and a bus analyser. There are a total of 21 tests defined in the procedures² and these will be described further later.

In addition to the fact that all devices used in the test must have a registered DD and CFF file, Table 1 summarises the requirements for each component of the host system.

The Host Interoperability System Test

Figure 1 represents the components of a generic host system as used in the definition of the Host Interoperability System Test. The Host Interoperability System Test only tests for compliance against the test criteria in eight areas. It does not make any effort to determine the cause of the failure. These eight areas of testing summarised from the test procedures are:

1. Initial Connection

- Installation of Device Description — verify the DD can be installed into the host system.
- Installation of Resource File — verify the Capability file can be installed into the host system.
- Configuration of Link Settings — verify the host can configure and change the link setting for the segment and the devices can adjust to the new settings.
- Configuration of the Point Descriptor tag
- Configuration of the Device Address

2. Links from Host

- Single Host Block — connect to the host interface using Publisher Subscriber (host interface) connection
- Multiple Host Blocks — link a single block parameter from one Publisher to several Subscribers (host interface)
- Single Block to Single Block — connect to the host interface using Publisher (host interface) Subscriber connection
- Single Host to Multiple Blocks — link a single block parameter from one Publisher (host interface) to several Subscribers

3. Links to Second Devices

- Single Publisher, Single Subscriber — simulates reading/writing between a host and field device with information from the host.
 - Single Publisher, Multiple Subscribers — simulates reading/writing between a host and multiple field devices with information from the host.
 - Single Subscriber, Single Publisher — simulates reading/writing between a host and field device with information from the field device.
 - Multiple Subscribers, Single Publisher — simulates reading/writing between host and field devices with information from the field devices.
4. Alert Links — verify the host can link fieldbus alarms.
 5. Trend Links — verify the host can link fieldbus trend parameters.
 6. Configuration of Parameters
 - Access to standard parameters — host can configure standard function block parameters.
 - Access to enhanced parameters — host can configure enhanced function block parameters.
 - Access to custom blocks — host can configure custom function block parameters.
 7. Redundant Link Master verification
 - Configure Link Master capable devices — confirm proper operation of devices after a communications download.
 - Link Master behaviour — Test functionality of Link Active Schedule by connecting and disconnecting from the host without disruption of the control messaging.
 8. Configuration of Control Strategies — configure at least three separate control strategies on the network.

Table 2 summarises the results of tests on the three host systems that have undergone the Host Interoperability System Test as of early May 2001.

Knowing what the test contains, it is now important to understand how to use it and its implications on industry.

How do I use it?

The Host Interoperability System Test will be used at the onset of a project and throughout a projects life cycle to verify that devices being purchased and installed at a facility will work reliably with the installed host system.

At the start of a grass roots or retrofit project, this same information will be used during the conceptual design stage to narrow down the list of possible host suppliers. Since this can happen as much as 3 years in advance of the actual commissioning of the project the HIST Letter of Compliance will serve as an indication technology available at the time with the expectation that it will be improved upon by the time of purchase and delivery.

HIST's affect on Industry

This series of tests is a major factor in the adoption of Foundation Fieldbus technology because Fieldbus now has complete testing and 'certification' for all aspects of its technology.

The associated increase in confidence and knowledge that an independent review of all components in the system work together reliably is only available from Foundation Fieldbus. Knowing that it is ultimately the end user community who determine the level of acceptance and 'drivers' for change, how will HIST affect Users and Manufacturers?

Users

As the people who end up having to make the system work, end users will use the HIST Letters of Compliance to select their host system based on the features it provides, especially the flexibility to incorporate the features they need for their installation.

End Users will also continue identify what future revisions and enhancements they would like to see added to the Host Interoperability System Test standard as well. Some possible features include:

- Support for High Speed Ethernet
- Integration with High Speed Ethernet
- Use and support of OPC (OLE for Process Control)
- Increased support and usability for enhanced diagnostics to a common interface / series of definitions
- Integration with Condition Based Monitoring systems (this requires the previous bullet to be better defined)

And I am sure that each person and industry will also have some unique needs. For example, the food and pharmaceutical industry's requirement for traceability and a better understanding of the operations inside of function blocks.

Manufacturers

The biggest challenge for manufacturers is to continue to meet the increasing demands of the users while continuing to insure that their host systems support the growing number of devices on the market. Towards this end, the Foundation has established a 'subscriber program' through which each host that has applied for a Letter of Compliance will have an opportunity to verify each new Fieldbus device as it is certified will work seamlessly with their host system.

Of course, as indicated in the list above, users will continue to want an increasing number of features, better integration, faster response, and more information than is available today. The net effect being that Fieldbus, as we know it, represents only the platform from which many more opportunities will arise.

The Future

Host Interoperability System Testing now gives participants in the instrumentation and control community the confidence that they can use Foundation Fieldbus and that it is indeed interoperable, interchangeable and poised for growth. It is time to Jump Aboard and make Fieldbus the control platform of choice.

Bibliography

¹ “Host Interoperability System Testing Project Management Plan,” 2000, Kurt A. Zech, FF-568

² “Foundation Fieldbus Host Interoperability System Test Procedures,” 2000, Document FF-569

Table 1: Host Interoperability System Test Requirements

Host	Configuration Tool		
	Network Configurator ^a	Inter-device Configurator ^b	Intra-device Configurator ^c
<ul style="list-style-type: none"> • Add a registered device to the system • Add a registered devices DD to the host system • Display the device's DD in the configuration and HMI display • Display Dynamic data • Create displays for FF devices • Operate any registered device • Receive, display, and manage device alerts 	<ul style="list-style-type: none"> • Support System Manager and Network Manager functions • Bring device to Unitialised, Initialised, or Operational state • Configure link settings in Link Master class devices • Prepare device for inter-device configurator • Addition of registered devices on-line and off-line • Configuration of CONFIGURED_LINK_SETTINGS for all Link Masters • Configuration of Primary Link Master • Configuration of Primary Time Master • Configuration of System Manager T1, T2 (device), and T3 (Configurator) 	<p>Calculate and configure:</p> <ul style="list-style-type: none"> • Server, Publisher, Subscriber, Source, and Sink Virtual Communication Resource (VCR) entries as appropriate • Function Block Application Program (FBAP) Linkage Objects (Publisher, Subscriber, Source, Sink, Local) • System Manager Function Block Start Entry Objects • Download of Link Active Schedule (LAS) to all Link Masters on link <p>Support Configuration of:</p> <ul style="list-style-type: none"> • Function Block Tags • Function Block Header objects based on schedule 	<p>Configuration of individual function block parameters including:</p> <p>Capability of:</p> <ul style="list-style-type: none"> • Displaying and configuration of all standard parameters of all released function blocks • Displaying a DD for any registered device • Access and configuration of transducer (custom) and manufacturer specific parameters <p>Support of:</p> <ul style="list-style-type: none"> • Capabilities File for off-line configuration • Configuration of trend objects.

^a For Device Initialisation

^b Schedule configurator

^c Parameter configurator

Table 2: Host Interoperability System Test Results^d

This table represents a 'side by side' comparison of the results posted as Appendix "A" on the Foundation Fieldbus web site at URL <http://www.fieldbus.org>

Manufacturer	Fisher-Rosemount Systems, Inc.	Smar	Yokogawa Electric Corporation
Model	DeltaV Control System	System 302	CENTUM CS / CS1000 / CS3000
Type	Fieldbus	Configuration Tool	SSSSM01-C1 Foundation Fieldbus tool
Revision	V5.3	V5.0	R3.10
Serial Number	NB9410634A		
Device ID	H1 Card, KJ 3004X1-BA1 SN: L000933466		
Communication Profile Class	21 pskc+22LT+23+24	32, 33, 34, 35	21 pskc+22+23+24
Stack			
Manufacturer	National Instruments	Smar	Softing GmbH
Revision	2.3 Link Master	3.40	FF-IF-PCAT-H1 v1.20
Test Campaign Number	CT0014FF	CT0026FF	CT0003FF
Host Features Supported			
Device Tag Assignment	Yes	Yes	Yes
Device Address Assignment	Yes	Yes	Yes
Configuration of Link Master Devices	Yes	Yes	Yes
Block Tag Configuration		Yes	Yes
Block Instantiation		Yes*	
Standard Blocks	Yes	Yes	Yes
Enhanced Blocks		Yes	Yes
Custom Blocks	Yes	Yes	Yes
Function Block Linkage Configuration	Yes	Yes	Yes
FF Alert Configuration			Yes
FF Alert			Yes
FF Trend Configuration			
FF Trend			
Device Description Services	Yes	Yes	Yes
Device Description Method Execution	Yes		Yes
Device Description Menu			Yes
Device Description Edit Displays			Yes*
Capability Files	Yes	Yes	Yes
Offline Configuration	Yes	Yes	Yes

* Implemented but not tested.

^d As of May 2001

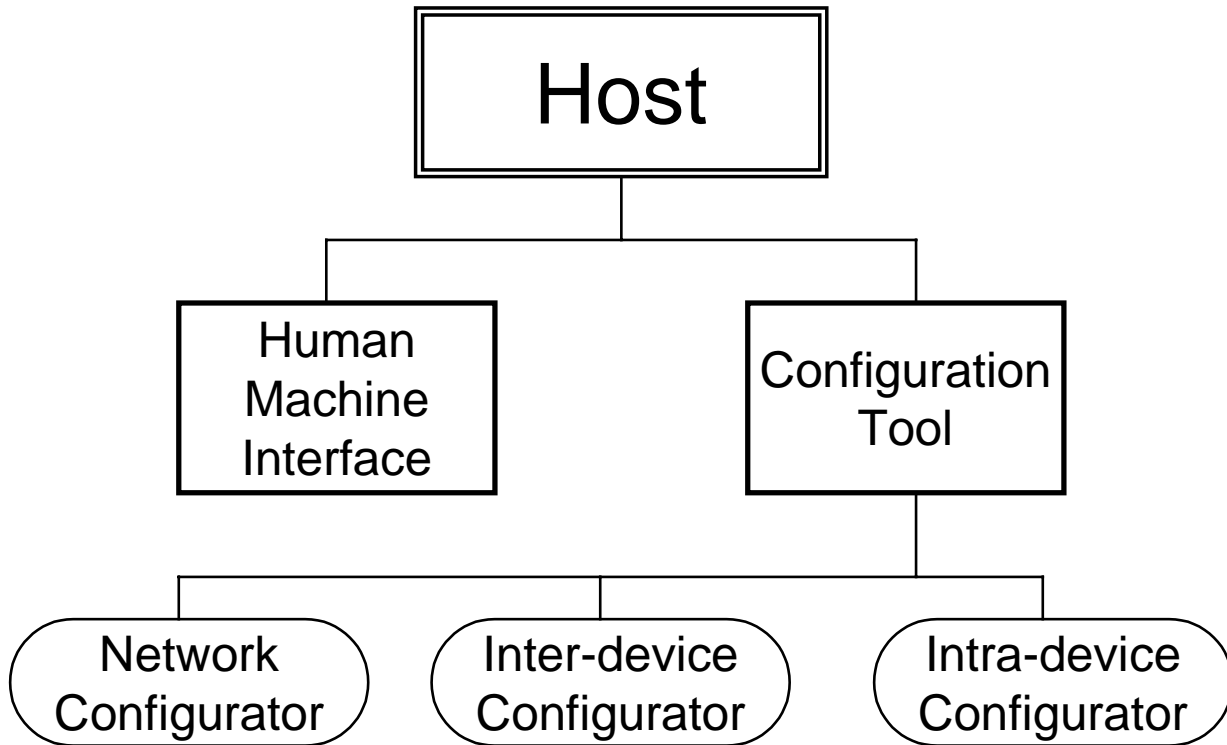


Figure 1 Host System Components