November 29, 2014

Foundation Fieldbus Looking Forward…
FF in DCS / SCADA perspective
Foundation Fieldbus – Looking Forward
FF High Speed Ethernet Technology

Unique Features

- FF H1 & FFHSE – Complementing technologies (not competing)
- Combining Technologies
  - FF H1 allows usage of interoperable FBL among devices on H1.
  - HSE allows publish / subscribe model for devices on network (not master / slave)
  - Flexible network design for overall control infrastructure
  - Caters to both functional and geographical process requirements
  - Zone Certified H1 Linking Devices
  - Virtual Marshalling

- HSE enables FF without need for controller (say for monitoring applications)
- HSE - Highly Fault Tolerant : Functions even in instance of Controller Hardware failure.
- FF HSE Infrastructure allows reaping benefits in future – ethernet based networking solution for control.

- The operator get access to Data and A&E without the controller which increases the availability.
- If the Host fails the control in the field adds availability.
- The control continues even if the HSE communication is cut off.
- Slightly Higher Availability compared to control in the Host.
- For smaller systems there is no need of a host controller which saves cost.
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FF HSE – Without Controller

- Using HSE as “fieldbus backbone” totally independent of controller network
- Only for Monitoring applications / No controls (say TMI’s)
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FF HSE – With Process Controller

- Data required by Controller routed to Controller
- Monitoring data directly to System
- Optimization of Controllers
- Optimized Engineering
- Lower Captial Cost
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FF HSE – Virtual Marshalling

- Controllers connected to multiple HSE n/w
- Geographical & Process flexibility
- Complete flexibility of data access across H1 segments by controllers
- Controllers can access device across segments.
- No requirement of peer to peer communication between Controllers.
- Controller resource optimization.
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FF HSE – Completely Redundant Configuration

Redundancy at following levels:
- LDHSE
- Communication Interface
- Controllers
- Servers
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Control in the Host Configuration

- Use of Function Blocks out of Controller Function Block Libraries (PID, …)
- Calculation and logic within controller
- Application resident in controller
- Transmission of values from field to controller and controller to the field
• Use of Function Blocks out of the device(s)

• Calculation within device(s)

• Application resident in device(s)

• Transmission of values from device to device (Block to Block)

• Transmission of Values and A&E from the devices to the operator.
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HSE - Control in the field, flexible, high available and scalable

“Control-in-the-Field” and Operations without DCS-Controller

Client/Server Network

Connectivity Server

Client/Server Communication

Report/Distribution

Publish/Subscribe Communication

FF HSE

Linking Device

Linking Device

FF H1 devices

FF H1 devices

PID

AI

AI

AO

•X2 redundant

X2

X2

X2

X2

X2

X2
HSE: Key to CIF Strategies For Improved Plant Automation

Distributed architecture via linking devices provides true networked solution

Among the major suppliers of process automation systems, few companies have taken a more active role in the implementation of FOUNDATION Fieldbus High Speed Ethernet (HSE) than ABB. The company developed one of the first HSE linking devices registered by the Fieldbus Foundation in June 2001. It was also among the first suppliers to register an HSE-compliant host system in April 2006.

ABB was recently selected to take part in a comprehensive testing project to evaluate the suitability of FOUNDATION HSE, as implemented for Control in the Field (CIF), for a major process industry and user.

Mark Tart, ABB Group Vice President, Control Systems Business, and Fieldbus Foundation board member, said his company’s selection of HSE for its Foundation Fieldbus networking standard was driven by the benefits the technology brings to customers.

“HSE provides opportunities for peer-to-peer communication between field devices as different H1 segments without the need to route through a process controller, as well as multiple controller access to field devices,” commented Tart. “These factors test results showing the true robust nature of the infrastructure are a great validation of our selecting HSE as the best way to implement Foundation Fieldbus.”

Tart continued, “Having made the choice to use HSE, it has proven to be a key component of our plant level network strategy demonstrating the Power of Integration that System 800xA can offer. Along with other Ethernet-based protocols like ModbusTCP, IEC-61850 for electrical information, and our latest offerings, PROFINET and DeviceNet using Ethernet/IP, we are able to offer and users their choice of networking protocols.

“An important benefit to our customers is the potential to have a single unified network for distributed I/O and control using the features and benefits of Ethernet. This is a single network for all protocols, and it builds from the fiber component base, one that is immune to much of the electrical noise that can plague copper-bases wiring systems in process facilities. Second to that Ethernet easily overcomes most of the distance issues that can be present with normal wired solutions. Widely distributing a common Ethernet network may also reduce wiring — the original benefit often touted for FOUNDATION Fieldbus — by reducing all of the segment design to a single H1 network.”

ABB Sales Support Engineer, Control Systems, Steve Walker, described his company’s role in the recent HSE testing. “For the FOUNDATION Fieldbus test program, we implemented a control system using HSE via linking devices designed to connect H1 segments in either a single or redundant configuration. This approach makes it possible to distribute linking devices across the plant with HSE as the network backbone. It also saves on the cabling expense of running H1 segments to the control room,” said Walker. “The use of FOUNDATION Fieldbus back-up Link Active Scheduler (LAS) functionality in field devices, as well as redundancy at the H1 bus and supervisory layer, ensures a high degree of system integrity. Field instrumentation can be integrated by importing standard DD and CIF files as provided by registered fieldbus devices.”

According to Walker, FOUNDATION Fieldbus control platforms fully implementing HSE provide a true networked solution, which allows the process owner to design an overall control infrastructure that reflects both the functional and geographic requirements of the process. This differs from a system design dictated by connecting individual H1 segments directly to controllers.

Additionally, an HSE-based solution provides options to deliver redundancy farther into the field environment for critical applications and other reliable visibility of field control area during those rare times when controller hardware fails.

“Our experience shows that a FOUNDATION Fieldbus control system can actually be less expensive to deploy than a comparable HART system,” said Walker. “That’s because FOUNDATION Fieldbus with HSE is easily made redundant, so that the user is not required to bring the entire control platform out to the H1 devices. Plus, the use of fiber optics makes it easy and cost-effective to undertake large fieldbus installations.”

AABB added, “The FOUNDATION HSE solution also simplifies the implementation of control functionality at the field level. Device data can be communicated across the HSE backbone and sent down different H1 segments — regardless of the distance.”

For more information, please see the ABB white paper titled Benefits of FF HSE with System 800xA, which can be found on the “Technology Articles” tab at www.abbglobal.com/knowledge_center/ABB.
Foundation Fieldbus – Looking Forward
FF in Petrochemical Plant
Foundation Fieldbus – Looking Forward
FF in SCADA Applications

- All AC800F RTU with FF and Hart interface
- FF based on HSE
- 950 FF Segments
- 5500 FF Devices
Case - 1
System Architecture

Tier 3 in Delhi with DR in Mumbai

13 nos. Tier 2 Locations

163 nos. Tier 1 Onshore SCADA Locations

8 nos. Tier 1 Offshore SCADA Locations

278 nos. RTU Locations
Typical System Architecture in Tier 1 Location
Typical FF Network in Tier 1 Location
Screen shots on FF device management implemented
Screen shots on FF device management implemented
Screen shots on FF device management implemented
66 location In and around Assam

**ABB Scope**
- One Tier 2 Data Centre
- 55 Tier 1 SCADA with FF RTU
- 11 Substation RTU with Numerical Relays
- 1500 Field Instruments PT, TT, DPT, MFM etc
- Motor Operated Valves
- Water Cut Meters
- Gas Chromatograph
- Well Head Monitoring Equipment setup
- 52 Control Room Civil Buildings
System Configuration

APPENDIX - A
OVERALL SYSTEM ARCHITECTURE

NEW SCADA SYSTEM
### Total FF H1 Segment implemented

<table>
<thead>
<tr>
<th>Total Location</th>
<th>FF Segment</th>
<th>Total Instruments connected</th>
<th>Future Expansion available</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>115</td>
<td>915</td>
<td>215</td>
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