FDI and FROM
Field Device Integration

Field Device Integration
Why Field Device Integration?

Process automation end users are asking for a single solution

- Current FDT and EDDL technologies with partial overlap cause competitive positioning
- Current situation is confusing because of conflicting messages

Suppliers face expensive development

- Most suppliers are simultaneously part of ECT organization and FDT.
- They must invest in parallel developments for EDDT and FDT.
With the Device Integration, a Host can get access (from a central location) to the Device functions and information.

With devices getting more complex, the device integration becomes a must.
A Common Approach
FDI is supported by Manufacturers and Foundations

- ABB
- Emerson
- Endress + Hauser
- Honeywell

- Invensys
- Siemens
- Yokogawa

- FDT Group
- Fieldbus Foundation
- HART Communication Foundation
- OPC Foundation
- PROFIBUS/PROFINET International
FDI Marketing Committee

- We are doing our part on the FDI marketing committee
- Handled logistics for press conference and board meeting at ARC Forum
- Press conference had excellent attendance
- North American automation media is now reporting on FDI
Target: **A single Device Driver**

The Device Package

- Device Definition (Def)
- Business logic (BL)
- User Interface (UID)

- Programmed User Interface
- Device Applications

Electronic Device Description Language (EDDL)  |  Windows Presentation Foundation (WPF)

- EDD
  - FDI encoded file format

- UIP (optional)

- Attachments
  - Manuals
  - Certificates
  - Protocol specific Files (GSD(ML), etc.)
Harmonized EDDL

Standard
FDI
Harmonized EDDL (IEC 61804-3)
PROFIBUS
Foundation Fieldbus
HART
UIP

Device Package development
FDI IDE

Certification/Registration
Package
EDD
UIP

Control system
FDI Host
FDI Client
UID Renderer
UID Hosting
OPC UA Services

FDI Server
Information Model
EDD Engine
OPC UA Services
Communication Server

© 1999 - 2014 Fieldbus Foundation
Common Development Environment

Integrated Development Environment (IDE)

- Editing
- Tokenizing
- Packaging
- Test Engine

Reference Host
- UID Renderer
- UIP Hosting
- EDD Engine

Device Package
- EDD
- UIP
- EDD
- UIP

Device
Vendor

Development → Test → Certification/Registration
Generic FDI Architecture

Within FDI (e.g. Within the Device Package) may be used only the harmonized EDDL
FDI Device Package Standard

- Device Definition (Parameters)
- Business logic (Rules)
- User Interface (Structure)
- User Interface Plugin
- Device Applications
- Product Manuals
- Images
- Electronic Certifications
- Protocol specific Files (CFF)
- Integrity
- Authenticity

EDD (mandatory)

UIP (optional)

Attachments (optional)

Electronic Device Description Language (EDDL)

Microsoft .NET/WPF for Workstation Platform
Specifications Available

Core FDI Specifications 0.9 available from
http://fdi-cooperation.com

FOUNDATION fieldbus
FDI DD Profile (FF-900 6.0)
available in latest specification release

http://forums.fieldbus.org
Fieldbus Foundation Tool Migration

DD Services

FDI Engine
- EDD Engine Built on DD Services
- Includes UI Engine components
- Supports legacy DD formats

FDI DD IDE
- Licensed per technology
- Based on Eclipse
- Supports legacy DD formats
- Package Builder
- Integrated Package Test Tool

First Beta Test available April 2014
1. FDI Device Packages may use only the harmonized EDDL.

2. FDI Host Systems implement the FDI Standard Components. The Host Components are maintained centrally.

3. The EDDL is mandatory in a Device Package.

4. User has the choice to activate UID and/or UIP of a Device Package

5. Migration path for the installed Base are provided.

6. Each device shall have only one Device package that can support optional features that may or may not be activated.
• FDI fulfills the End-User requirements
• Process Automation manufacturers support FDI
• The Preliminary Draft Specifications available Q1/12
• The IEC Standardization is underway
• The EDDL was harmonized across HART, Profibus and Fieldbus Protocols
• FDT-FDI Interoperability
• The “Foundations” work together in the FDI Cooperation LLC to finalize the FDI Specifications, Tools and Standard Components
Our Future Direction: Helping Users Realize Foundation™ Benefits
See Your Process in High Definition

- Diagnostic Data from FOUNDATION Fieldbus Devices is Miles Ahead of Other Technologies
- Incorporation of NAMUR NE 107 Diagnostics
- Transmission of multiple process variables
- User layer!
- Physical layer diagnostics
- Distinguishing Device Problems from Process Problems
The old Remote Operations Management Model

- Systems collect historical data
- End users analyze the data using their tools and their intellect
- End user make decisions about the future based on their conclusions and historical data
- Steady state environment
- “Coordination comes from a central location in a rigid, hierarchical fashion”: ARC Advisory Group
- Hard wired
- Large degree of customization is often the case
- Run to failure
Introducing FOUNDATION for Remote Operations Management

- Provides a wireless and wired infrastructure for remote assets and applications, all within FOUNDATION fieldbus
- Integrates Wired Infrastructure, Remote I/O, ISA100.11a and WirelessHART®
- Incorporate remote operations data into FOUNDATION Fieldbus infrastructure for data management with direct access to device diagnostics
- FOUNDATION for ROM has the potential to transform remote operations, providing greater reliability and reduced costs.
Application Example

Control Room

Remote Process

HSE Wired and Wireless Backhaul

BACKHAUL: WIFI, WIMAX, SATELLITE, CELLULAR, ETC.

Wireless Backhaul Enables Access To Remote Sensors Using Standard Wireless Technologies

I/O

H1

HART

Wireless
What are FOUNDATION for ROM Products?

- More than a simple protocol translation gateway
- Capability Can be Embedded into Existing RTUs, Controllers, etc.
- Will be Tested & Registered with Fieldbus Foundation
The Business Value of FOUNDATION for ROM for End Users

- Enables real time operations management and more effective use of remote experts
- Enables Predictive Maintenance Strategy
- Fewer Personnel
- Reduced engineering and operational costs
- Familiar & comprehensible to a good DCS engineer
- Highly configurable
- Increased Reliability & Availability
- Open and Interoperable Standard
- Less Customization
- Greener

Source: Aramco
FOUNDATION for ROM Device Consolidates Diagnostic Data from Different Networks....

FOUNDATION for ROM Device

FOUNDATION Infrastructure for Data Management and Diagnostic Information

Transducer Blocks

Diagnostic & Instrument Data

Conventional I/O Data

Diagnostic & I/O Data

Diagnostic & Instrument Data

Diagnostic & Instrument Data

Diagnostic & Instrument Data

WirelessHART

HART I/O

ISA100.11a
And Transmits That Data Across the Wired or Wireless Backhaul to a Central Location/s

HSE Wireless Backhaul

Host System
Central Control Room
Remote Monitoring Station
Etc.

Conventional I/O
HART I/O
HART Blocks
FOUNDATION Infrastructure for Data Management and Diagnostic Information
Technical Specification Development Program

Basic Control
- Analog Input
- Analog Output
- Bias & Gain
- Control Selector
- Discrete Input
- Discrete Output
- Manual Loader
- PD Control
- PID Control
- Ratio Control

Advanced Control
- Analog Alarm
- Arithmetic
- Deadtime
- Device Control
- 8 Channel Discrete Input/Output
- Flexible Function Block
- Input Selector
- Integrator
- Lead/Lag
- Setpoint Ramp Generator
- Signal Characterizer
- Splitter
- Timer

Remote Operations Management
- Large Point Count Remote Devices
- 64 Channel Discrete Input/Output
- 16 Channel Analog Input/Output
- Wired HART® Connectivity
- Wireless Connectivity
  - Wireless HSE Backhaul
  - Wireless Field Devices
    - WirelessHART®
    - ISA100.11a
FOUNDATION for ROM Development Phases
FOUNDATION for ROM Development Teams

- Large Point Count Device
- Multi-channel I/O
- Wired HART Block

HSE Remote I/O
HSE-RIO Team

Fieldbus Foundation – ISA Cooperation
ISA100.15 Working Group

Wireless HSE Backhaul

Conventional I/O
H1
Wired HART

Wireless Sensor Integration Team

WirelessHART
ISA100.11a
**Configuration**

1. User configures Expected Tags in Association Block
2. ROM Device instantiates appropriate Transducer Blocks
   e.g. RIO, HART, WirelessHART, ISA100.11a
3. ROM Device changes TB Tag to Expected Tag
4. TB are connected to FBs.
5. FB links and device diagnostics are configured

**Operation**

- Real-time process data published as configured
  - Control
  - HMI
  - Asset Management
- Device diagnostics are reported as configured
  - Control
  - HMI
  - Asset Management
  - Maintenance
Device Diagnostics

- Utilizes advanced diagnostic capabilities of intelligent devices
- 4 standard “status signals” categories are available
- Mapping of diagnostics in status signals configurable by user
- Enables condition-based maintenance – automatic work orders
- Optimizes maintenance functions
- Detailed information available on demand
FOUNDATION for ROM – Wireless Backhaul Model

CCD - Set of devices

BHI - Provides isolation and security of communications flows

BSP - Provides connectivity between CCD's

IF1 - Physical interface to the backhaul technology

IF2 - Protected data flowing across the backhaul - authentication, authorization, encryption

IF3 - Physical interface to CCD

IF4 - Transparent end-to-end communication between CCDs

IF5 - Management - Configuration of IF1-IF3 and BHI functions
FOUNDATION for ROM – WirelessHART Integration

Association Block (AB)

TB<sub>LL</sub>

TB Tag = “HART_LIVE_LIST_GW_1”

TB<sub>HART</sub>

TB Tag = “HART_5”

Gateway | Expected Tag | Network Address | Status
---|---|---|---
GW_1 | HART_5 | 5 | Good
GW_1 | HART_7 | 7 | Bad
GW_1 | HART_9 | 9 | Good
GW_1 | HART_10 | 10 | Good
GW_1 | HART_11 | 11 | Bad

Network Address 9

Network Address 10

Network Address 11

WirelessHART Mesh

Data + Status

Device Diagnostics
FOUNDATION for ROM – ISA100.11a Integration

<table>
<thead>
<tr>
<th>Gateway</th>
<th>Expected Tag</th>
<th>Network Address</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>GW_1</td>
<td>ISA_5</td>
<td>5</td>
<td>Good</td>
</tr>
<tr>
<td>GW_1</td>
<td>ISA_7</td>
<td>7</td>
<td>Good</td>
</tr>
<tr>
<td>GW_1</td>
<td>ISA_9</td>
<td>9</td>
<td>Good</td>
</tr>
<tr>
<td>GW_1</td>
<td>ISA_10</td>
<td>10</td>
<td>Bad</td>
</tr>
<tr>
<td>GW_1</td>
<td>ISA_11</td>
<td>11</td>
<td>Good</td>
</tr>
</tbody>
</table>
Media Day Demo, Lee College, Baytown Texas
FOUNDATION for ROM Media Event
December 1 at Lee College

Operator Station  Wireless Backhaul  Security

Wi-Fi

HSE  HSE  HSE  HSE

I/O  I/O  I/O

H1

ISA100.11a  WirelessHART

HART
Live Field Demos Started in 2013

- Petrobras
- Reliance Refining
- Saudi Aramco
- Two more sites to be identified
## Supplier Sponsors for Field Demos

<table>
<thead>
<tr>
<th>Advanced Process Automation Technologies (APAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azbil (Yamatake)</td>
</tr>
<tr>
<td>BEKA Associates</td>
</tr>
<tr>
<td>Emerson Process Management</td>
</tr>
<tr>
<td>Festo Brasil Ltda.</td>
</tr>
<tr>
<td>MTL</td>
</tr>
<tr>
<td>Phoenix Contact</td>
</tr>
<tr>
<td>Reliance Jamnagar</td>
</tr>
<tr>
<td>R. STAHL Schaltgerate GmbH</td>
</tr>
<tr>
<td>Smar International Corporation</td>
</tr>
<tr>
<td>Westlock Controls Corporation</td>
</tr>
<tr>
<td>Yokogawa Electric Corporation</td>
</tr>
</tbody>
</table>
Fieldbus Foundation Booth
F-ROM Host System and Wireless Devices

- Host System
- Wireless Terminal
- Wireless Gateway
- ISA100 Wireless Devices
- WirelessHART Devices
Remote IO

- P+F
- R Stahl

Valves (L to R)
- Motor Valve (HART)
- Motor Valve (FF H1)
- Control Valve (FF H1)
- Control Valve (FF H1)

HSE Linking Device
FOUNDATION Fieldbus (H1)
Thank You

Questions?