FOUNDATION for Remote Operations Management

ROM – Remote Operations Management

Speakers:
Larry O’Brien, Fieldbus Foundation

2012 ISA Water & Wastewater and Automatic Controls Symposium
August 7-9, 2012 – Orlando, Florida, USA
• **Larry O’Brien:** Larry O’Brien joined the Fieldbus Foundation as global marketing manager in April 2011. Prior to his job at the foundation, O’Brien was research director for process automation at ARC Advisory Group, where he began work in 1993. As an industry analyst and market researcher, O’Brien covered the topics of process fieldbus, distributed control systems, process safety, automation services, and intelligent field instruments. He has authored or co-authored numerous market forecast reports, strategic-level advisory reports and white papers for ARC and its clients, including all the major process automation suppliers. O’Brien has a bachelor’s degree from the University of Massachusetts at Lowell.
Outline

- Remote Operations Management: Definition and Business Challenges
- Foundation for ROM Technology and Application Examples
- Demos schedule and latest spec release (Wired and Wireless Technologies)
Remote Operations Management Applications

- Water & Wastewater SCADA
- Oil & Gas Pipeline SCADA
- Offshore Platforms
- Oil & Gas Fields
- Tank Farms & Terminal Automation
- Mining
Business Drivers for Growth in Remote Operations Management Market

- Plant operations are becoming more geographically dispersed
- Resources are being found in increasingly hard to reach and hazardous areas
- Effort to get people out of harm’s way and reduce personnel requirements: “Lights Out” operation
- Need to transport resources over greater distances
Water Industry is Set to Boom

• Water is the new oil,” says Jim Rogers, chief executive of Duke Energy.

• More use of sophisticated technologies means more sophisticated automation.

• In the US, the old water infrastructure desperately needs to be upgraded.

• Desalination plant construction set to boom.
The Business Challenges

- Traditional approach does not work
- Move from steady state to dynamic environment
- Dynamically changing supply and demand
- Tighter production specifications
- Increased regulatory pressure
- Human resources challenge: Increasingly challenging to send operators to check remote service areas
- Integration of wireless technology
- Increased focus on cyber security

Workers Check a Pipeline in China
Source: AP
End User Requirements

- Users need a real time view into what’s happening in widely dispersed remote assets

- Users need to know the state of the assets as well as the state of the process

- Process must keep running safely in the event of loss of communication with remote assets/process

- Solution must provide high level of both physical and cyber security

- A lot of complex equipment. Need to link in people that understand this equipment in a secure fashion around the world
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.

HSE RIO Spec

Wireless Spec

HSE Backhaul

2012 ISA WWAC Symposium
Aug 7-9, 2012 – Orlando, Florida, USA
Application Example

Control Room

HSE Wired and Wireless Backhaul

FOUNDATION for ROM Device

I/O

H1

HART

HART

Wireless

Remote Process

Wireless Backhaul Enables Access To Remote Sensors Using Standard Wireless Technologies
What are FOUNDATION for ROM Products?

- More than a simple protocol translation gateway
- Not a new product! An extension to our spec
- Capability Can be Embedded into Existing RTUs, Controllers, Wireless Gateways
- Will be Tested & Registered with Fieldbus Foundation
The Business Value of FOUNDATION for ROM for End Users

- Enables 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
- Less Customization
- Greener

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

FOUNDATION Infrastructure for Data Management and Diagnostic Information

- Transducer Blocks
- Diagnostic & Instrument Data
- Conventional I/O
- Wireless HART
- HART I/O
- ISA100.11a

DIAGNOSTIC & INSTRUMENT DATA
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.

2012 ISA WWAC Symposium
Aug 7-9, 2012 – Orlando, Florida, USA
Managing Diagnostic Data from Multiple Networks in a Single Infrastructure

- Easier audit trail and reporting
- Data is time-stamped
- FOUNDATION Fieldbus devices can indicate data quality -- whether signals communicating setpoints, PVs, etc. have good, bad or uncertain quality
- Structured data and data quality means improved handling of failures when one does happen
- Failure is alarmed, handled by control algorithm
# NAMUR NE 107 Diagnostics Capability

<table>
<thead>
<tr>
<th>Status signal</th>
<th>Color</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal; valid output signal</td>
<td><img src="none" alt="Green" /></td>
<td><img src="none" alt="Green" /></td>
</tr>
<tr>
<td>Maintenance required; still valid output signal</td>
<td><img src="none" alt="Blue" /></td>
<td><img src="none" alt="Maintenance" /></td>
</tr>
<tr>
<td>Out of specification; signal out of the specified range</td>
<td><img src="none" alt="Yellow" /></td>
<td><img src="none" alt="Warning" /></td>
</tr>
<tr>
<td>Function check; temporary non-valid output signal</td>
<td><img src="none" alt="Orange" /></td>
<td><img src="none" alt="Function Check" /></td>
</tr>
<tr>
<td>Failure; non-valid output signal</td>
<td><img src="none" alt="Red" /></td>
<td><img src="none" alt="Failure" /></td>
</tr>
</tbody>
</table>
A Single Environment for Information in Context & Data Quality

Remote Processes

- Maintenance
- Operations
- Engineering

Process Control
Custody Transfer
Machinery Health Monitoring
Fire & Gas Detection
Safety Interlocks

Data Management & Quality
Application Examples: Water and Wastewater

- Water distribution networks
- Water treatment plants
- Desalination plants
- Industrial and municipal applications
Application Examples: Mining, Hydro Fracking

- Coordination of widely dispersed automation assets
- Oil sands
- Concentrating data from multiple wellheads
- Large water treatment requirements
- Smaller environmental footprint
Application Examples: Oil and Gas Fields

- Enables Integrated Operations

Integrated Operations is cost reduction, work process efficiency and volumetric improvement via ...
Application Examples: Pipelines

- API Monitoring, Custody Transfer

Source: Moxa
Application Examples: Tank Farms

• Overfill Protection, Integration of Fire & Gas Detection
Application Examples: Skid Mounted Equipment

- Faster Integration of Multiple Skid Mounted Mobile Units
- Faster Commissioning
- Easier Validation
- Reduced Cost to Both End User and OEM

FOUNDATION Fieldbus Instrumentation on a Skid Mounted Fermenter
Source: PharmaManufacturing.com
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

Safety Instrumented Functions

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

2012 ISA WWAC Symposium
Aug 7-9, 2012 – Orlando, Florida, USA
FOUNDATION for ROM Development Phases

HSE Remote I/O (HSE RIO)

Wired HSE

FOUNDATION for ROM Device

HSE Wireless Backhaul and WirelessHART® Interface

Wireless HSE Backhaul

FOUNDATION for ROM Device

ISA100.11a Interface

Wireless HSE Backhaul

FOUNDATION for ROM Device

Interface to Other Networks and Flexible Function Blocks

Wired HSE

or

Wired HSE Backhaul

FOUNDATION for ROM Device

Other Networks (e.g. MODBUS)
FOUNDATION for ROM Development Teams

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

Conventional I/O

HSE Remote I/O
HSE-RIO Team

Fieldbus Foundation – ISA Cooperation
ISA100.15 Working Group

Wireless HSE Backhaul

Wireless Sensor Integration Team

2012 ISA WWAC Symposium
Aug 7-9, 2012 – Orlando, Florida, USA
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

Association Block (AB)
- AB_001; Expd_Tag=TIC_334
- AB_002; Expd_Tag=TIC_335
- AB_003; Expd_Tag=TIC_336
- AB_nnn; Expd_Tag=TIC_nnn

TB Tag = "TIC_336"

TB Tag = "TIC_334"

FB Tag = "Tank_1"

2012 ISA WWAC Symposium
Aug 7-9, 2012 – Orlando, Florida, USA
FOUNDATION for ROM – WirelessHART Integration

Association Block (AB)

TB HART
TB Tag = “HART_5”

TB LL
TB Tag = “HART_LIVE_LIST_GW_1”

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

Mesh Status

WirelessHART Mesh

Gateway 1
Network Address 5
Network Address 9
Network Address 10
Network Address 11
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 – 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>

Network Address 5
Network Address 7
Network Address 9
Network Address 10
Network Address 11

Mesh Status

ISA100.11a Mesh

2012 ISA WWAC Symposium
Aug 7-9, 2012 – Orlando, Florida, USA
Media Day Demo December 2011 Lee College, Baytown Texas
# Specification Development Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Draft Preliminary Specifications – Conventional I/O, HART, WirelessHART</td>
<td>Oct</td>
</tr>
<tr>
<td>2009</td>
<td>Wireless Backhaul Networking Team Kickoff</td>
<td>Jan</td>
</tr>
<tr>
<td></td>
<td>Validation Team Kickoff Meeting</td>
<td>Feb</td>
</tr>
<tr>
<td></td>
<td>First Laboratory Prototypes – Conventional I/O</td>
<td>Aug</td>
</tr>
<tr>
<td>2010</td>
<td>First Laboratory Prototypes – HART</td>
<td>Mar</td>
</tr>
<tr>
<td></td>
<td>First Laboratory Prototypes – Wireless Backhaul</td>
<td>Aug</td>
</tr>
<tr>
<td></td>
<td>First Laboratory Prototypes - WirelessHART</td>
<td>Nov</td>
</tr>
<tr>
<td></td>
<td>ISA100.11a Development Team Kickoff</td>
<td>Oct</td>
</tr>
<tr>
<td></td>
<td>Preliminary Specifications – Conventional I/O</td>
<td>Dec</td>
</tr>
<tr>
<td>2011</td>
<td>Final Specifications – Conventional I/O</td>
<td>Apr</td>
</tr>
<tr>
<td></td>
<td>Preliminary Specifications – Wired and WirelessHART</td>
<td>Sep</td>
</tr>
<tr>
<td></td>
<td>Wireless Backhaul Architecture Model Approval by ISA100.15</td>
<td>Oct</td>
</tr>
<tr>
<td></td>
<td>FOUNDATION for ROM Media Event at Lee College</td>
<td>Dec</td>
</tr>
<tr>
<td>2012</td>
<td>FOUNDATION for ROM Demo Working Group Kickoff</td>
<td>Feb</td>
</tr>
<tr>
<td></td>
<td>Final Specifications - Wired and WirelessHART</td>
<td>Jun</td>
</tr>
<tr>
<td></td>
<td>ISA100.11a Draft Preliminary Specification</td>
<td>Soon</td>
</tr>
<tr>
<td></td>
<td>FOUNDATION for ROM Media Event at Jemima - Japan</td>
<td>Oct</td>
</tr>
</tbody>
</table>

*2012 ISA WWAC Symposium
Aug 7-9, 2012 – Orlando, Florida, USA*
Live Field Demos Being Planned Starting in 2013

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

- APT
- Emerson
- BR
- Invensys
- Azbil
- Bürkert
- Festo
- Petrobras
- Saudi Aramco
- Reliance
- BEKA
- MTL Instruments
- Smar
- Pepperl+Fuchs
- Chevron
- Phoenix Contact
- Stahl
- Yokogawa
- Westlock Controls
Thank You