ISA CORPORATE PARTNERSHIPS PROGRAM

Challenges of Multivendor Systems in Implementation of IIoT-ready PLCs

ISA/Honeywell Webinar

10 November 2016

Setting the Standard for Automation™

Before we begin: *Challenges of Multivendor Systems in Implementation of IIoT-ready PLCs*

- Listen online *OR* call-in:
  - **Call-in toll-free number:** 1-866-657-0092 (US)
  - **Call-in number:** 1-832-445-3182 (International)
  - **Conference Code:** 682 284 3439

We start at 11 am ET

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- **Your line will be MUTED**
  - If you have a question for the host, please use the **WebEx Chat Tool** on the right-hand side of your screen. Please ***do not*** use the Q&A box for miscellaneous questions. The Q&A chat box is reserved only for our Q&A sessions during the webinar.

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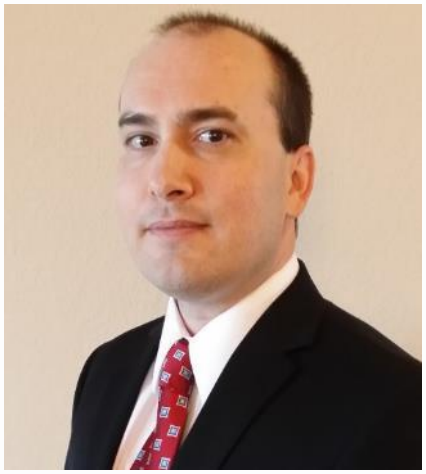
Poll Questions | Questions & Answers

- There will be four (4) Poll Questions
- Enter answers into the **Poll Feature** on the right-hand side of your WebEx window.
- There will be one (1) Q&A Session
- Enter questions into the **Q&A box** on the right-hand side of your WebEx window.
- Unfortunately, with this many attendees, we cannot open up the phones for questions.

Graham Nasby

- Water SCADA & Security Specialist for a large publicly-owned water utility in North America.
- Responsible for the capital planning and day to day operation of the utility's geographically disbursed automatic control systems.
- Extensive experience with the design and operation of industrial control systems, including both PLC/SCADA and DCS systems.
- Voting member of the ISA-18.2 alarm management committee and a Certified Functional Safety Engineer (Safety Instrumented Systems).

Andrew Brodie



- Global Control Offerings Marketing Leader, Honeywell Process Solutions
- 20+ years of hands-on process automation experience spanning several disciplines including engineering, business development, sales, product management, and product marketing.
- He has industry knowledge from oil and gas production, pharmaceutical manufacturing, power generation, and discrete manufacturing.
- Andrew holds undergraduate degrees in Industrial Instrumentation Technology and Business Information Systems plus an MBA in Technology Management.

Poll Questions

1. Are you currently using a DCS integrated to PLCs?
   - A. Yes
   - B. No

2. Have you ever integrated a DCS with a PLC?
   - A. Yes
   - B. No

3. Have you participated in any applications of IIoT technology?
   - A. Yes
   - B. No

4. Does your company have a position or strategy on IIoT technology adoption?
   - A. Yes
   - B. No
   - C. Uncertain

Agenda

I. Introductions
II. Pros & Cons of Integrated Solutions for PLC/DCS systems
III. Connecting IIoT Devices to PLC & DCS Systems

IV. Overview of Opportunities with IIoT integration

V. Q&A Session
VI. Conclusion

Pros & Cons of Integrated Solutions for PLC & DCS-based Industrial Control Systems

Presentation Outline

- Overview
- Anatomy of a Modern Control System
- Traditional PLC & DCS Systems
- Common Integration Challenges

- I/O and Device Level Communications
- Controllers & Controller Programming
- Process Control Network
- Data Servers: Setup and Configuration

- HMI Screens & Alarms
- Bringing Process Data into Corporate/IT Systems
- How does IIoT fit into this?
- Opportunities for IIoT: Making Integration Easier

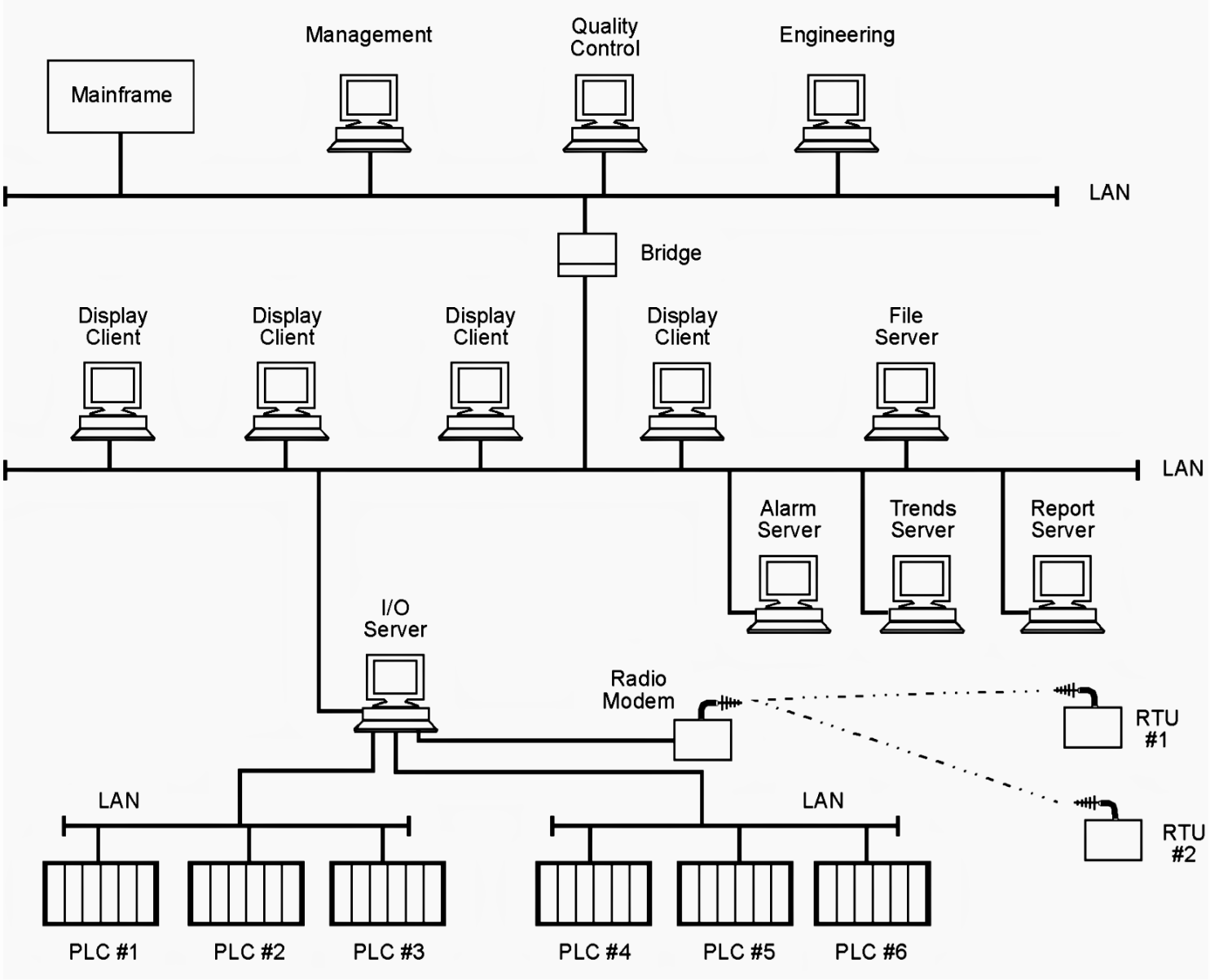
Industrial Control Systems

- Field Equipment (Sensors, Transmitters, Pumps, Valves, etc.)
- Field Wiring – hardwired I/O & Fieldbus

- PLCs, PACs, RTUs, Controllers, etc. / Interface Equipment
- Control System Networks
- Servers
- Operator View Stations

- Data Tags
- Process Displays
- Alarm System / call-out systems
- Historian
- Reporting

Traditional PLC/SCADA System



Other Systems

View Nodes

SCADA Servers
Process Network
Historian

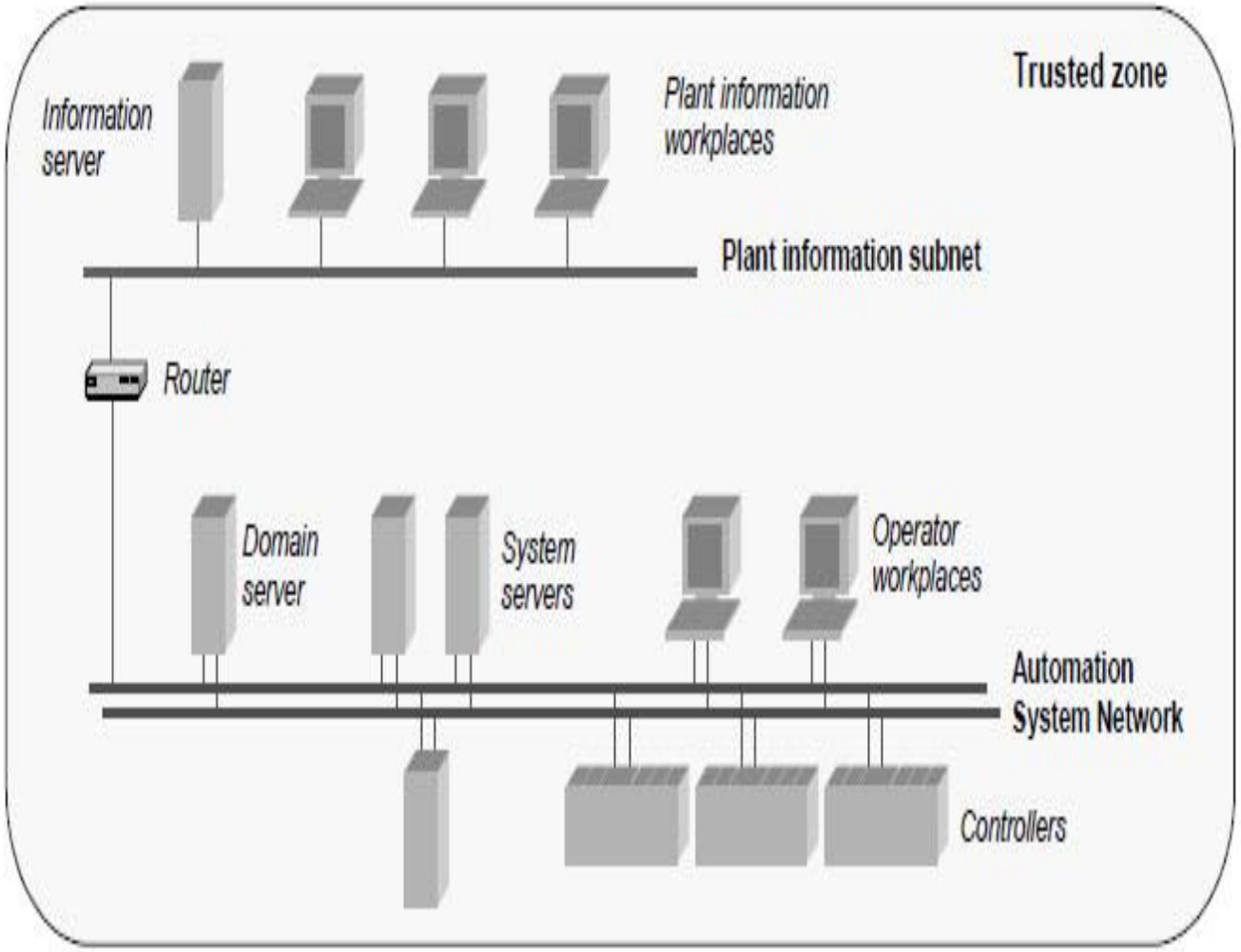
I/O Server

PLCs

Field Wiring

Instruments
& Devices

Traditional DCS System



Other Systems

Operator Terminals

Engineering Workstation

DCS Servers & Historian

Process Network

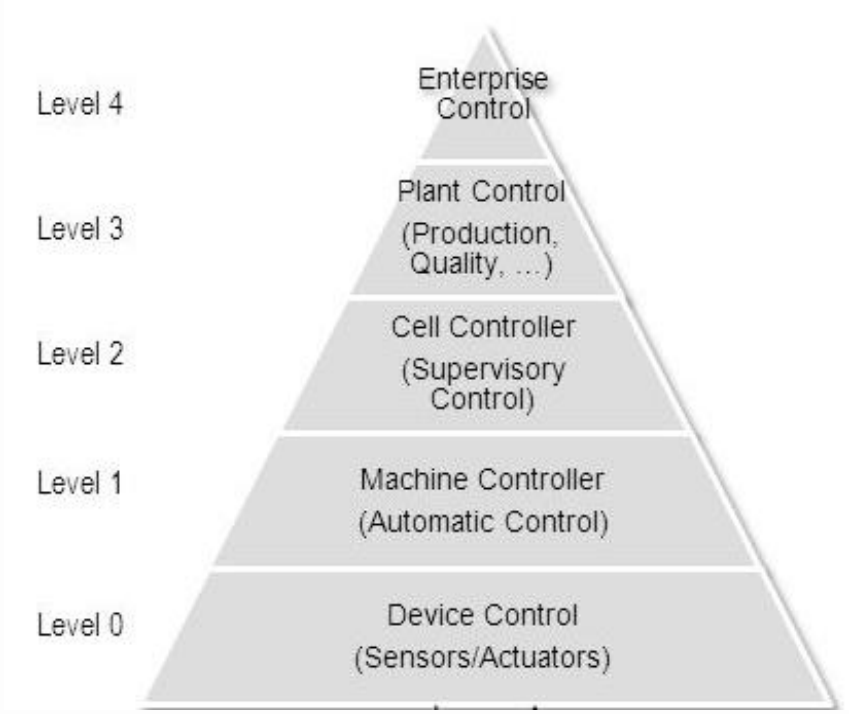
Controllers

Field Wiring

Instruments
& Devices

Modern Control System Layers

- View Terminals (HMI)
- Server Components
  - Application Servers (Screens)
  - Alarm System
  - Call-out Alarm System (if applicable)
  - Historian
  - Trend/Reporting System
- I/O Servers
- Process Network



- Programmable Controllers (PLCs, RTUs, RTACs, etc.)
- I/O Cards
- Field Wiring
- Device Level (Transmitters, Drives, Valves, etc.)

I/O and Device-Level Communications

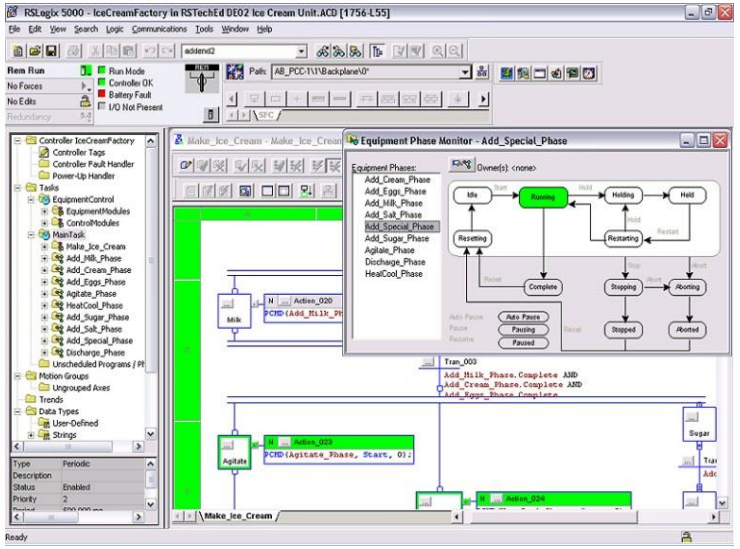
- Hardwired I/O
  - Digital Inputs/Outputs – Voltage, Contact Type, Sink/Source, etc.
  - Analog Inputs/Outputs – Voltage, Current, Other
- Fieldbus I/O
  - Profibus
  - Foundation Fieldbus
  - DeviceNet
- Network Connectivity
  - Ethernet
  - Modbus, Ethernet/IP, ProfiNet, etc.

- Integration Tasks
  - Selecting I/O Types, Configuring I/O Cards, Programming, Scaling, Setup

Controllers & Controller Programming

- PLC Systems
  - Separate programming environment from HMI
  - May be “tag-based” or “memory register based”
  - Some systems support function blocks/templates
  - Easy to customize – just write more code!
  - Labor-intensive to program

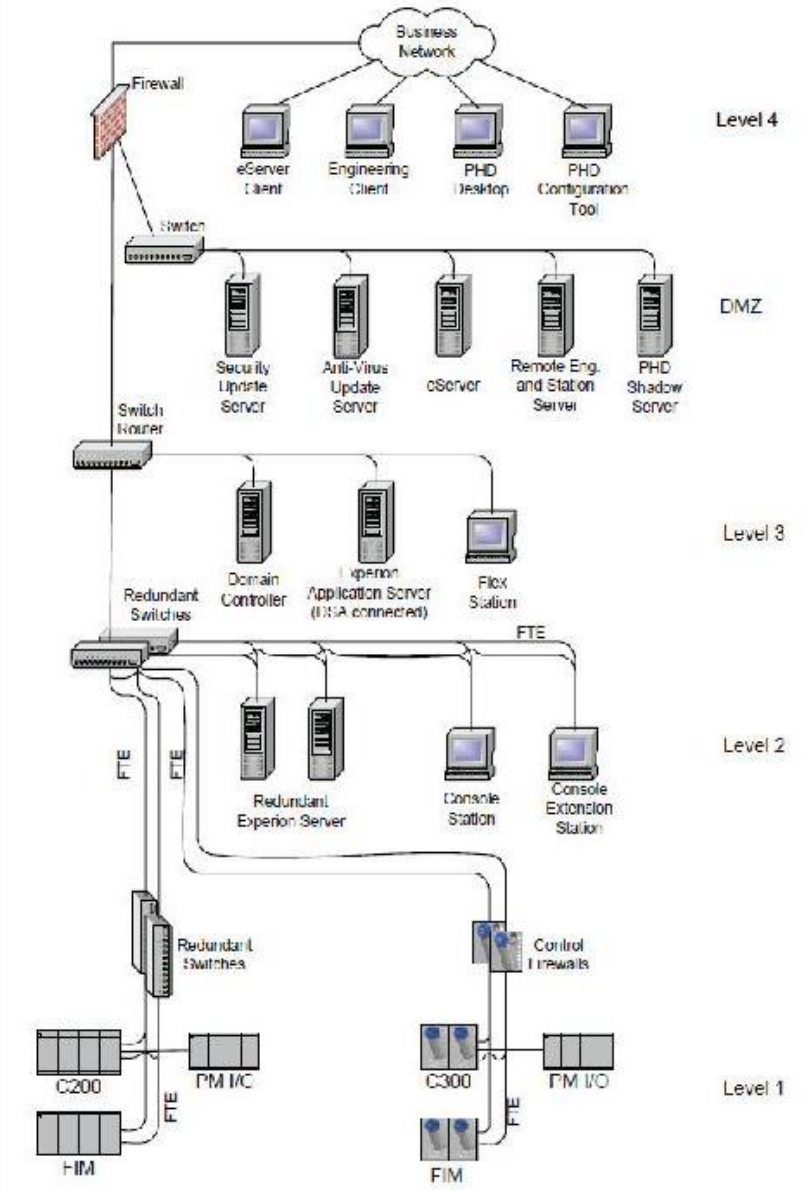
- DCS Systems
  - Integrated development environment with HMI
  - Reusable modules for common tasks
  - Sometimes customization can be tricky



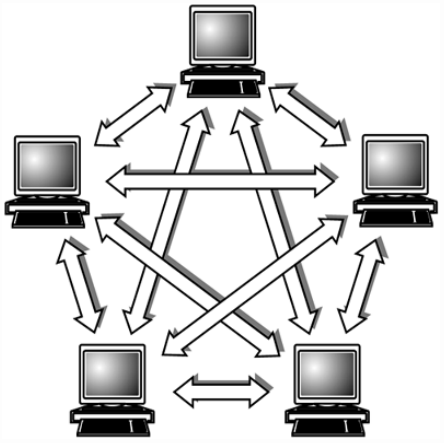
- Hybrid Systems

Process Control Network

- PLC Systems
  - Router configurations
  - Firewalls
  - Assigning & managing IP addresses
  - How to Manage Configuration/Change
- DCS Systems
  - Often have network management tools
- Integrated DCS Systems
  - Turn-key network system: “Lego Bricks”



Data Servers – Setup/Configuration



- Bringing data into the control system
- Control systems talk to field devices using “data tags”

- PLC/SCADA Systems
  - Data server needs to connect to each PLC
  - Often separate “tag database” to translate PLC tags to server
  - If multiple PLCs, multiple drivers/configurations needed

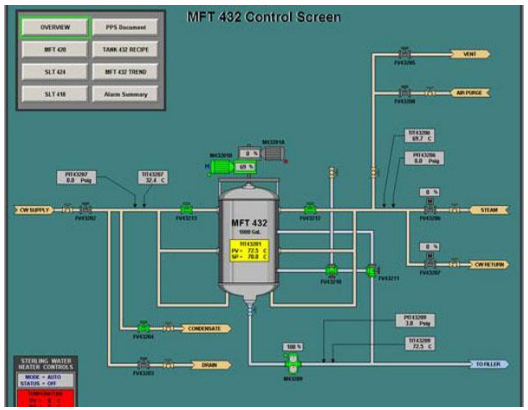
- DCS Systems
  - Typically little to no setup, as this is handled at the controller level

- Non-Standard Devices
  - May require special drivers/programming to connect data

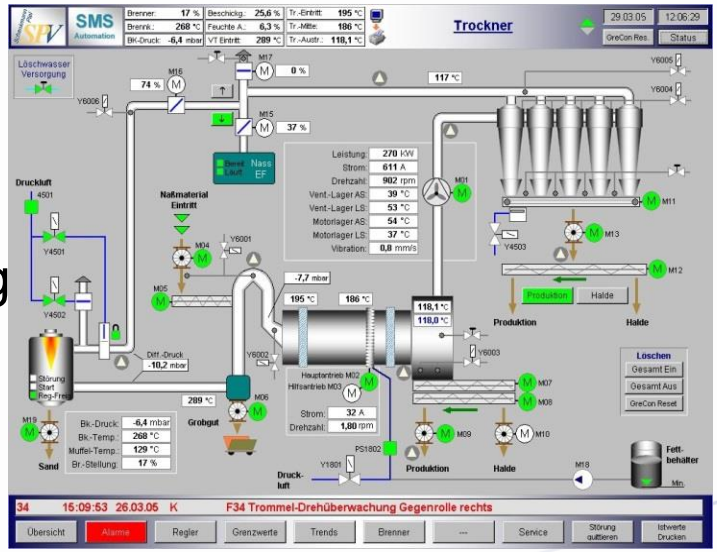
HMI Screens & Programming/Deployment

- Operators use the HMI to interact with the control system

- PLC/SCADA Systems
  - Typically programmed separately from PLCs
  - Separate programming environment
  - Usually use Tag Database that is on the Data Servers
  - May be able to talk to PLCs directly, but usually not
  - Amount of custom programming varies by system



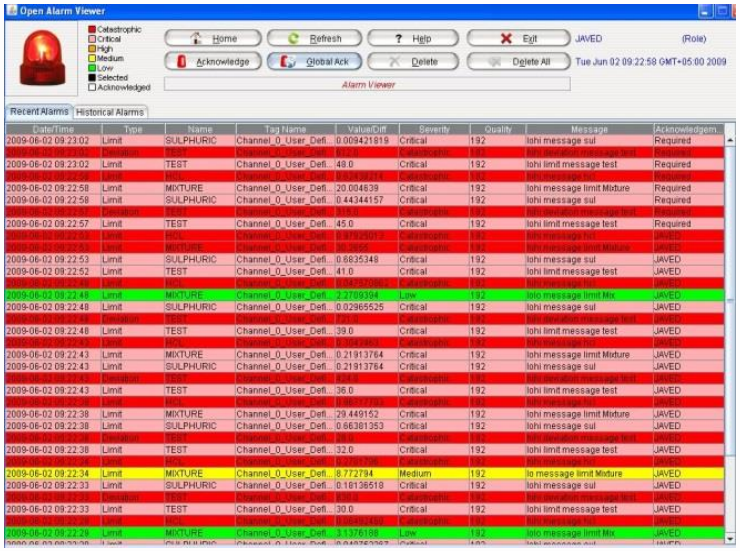
- DCS Systems
  - Integrated development environment
  - Usually has built-in “toolkit” reduce programming



Alarm System

- Generates “Alarms” to interrupt operator so they can action
- Alarms alert the operator to conditions requiring a response

- Alarm Trigger Conditions
  - Base Alarm Condition
  - Alarm Logic
  - Filters: On/Off-Delay, Deadband, Plant State, etc.
  - Alarm Routing to right Operator



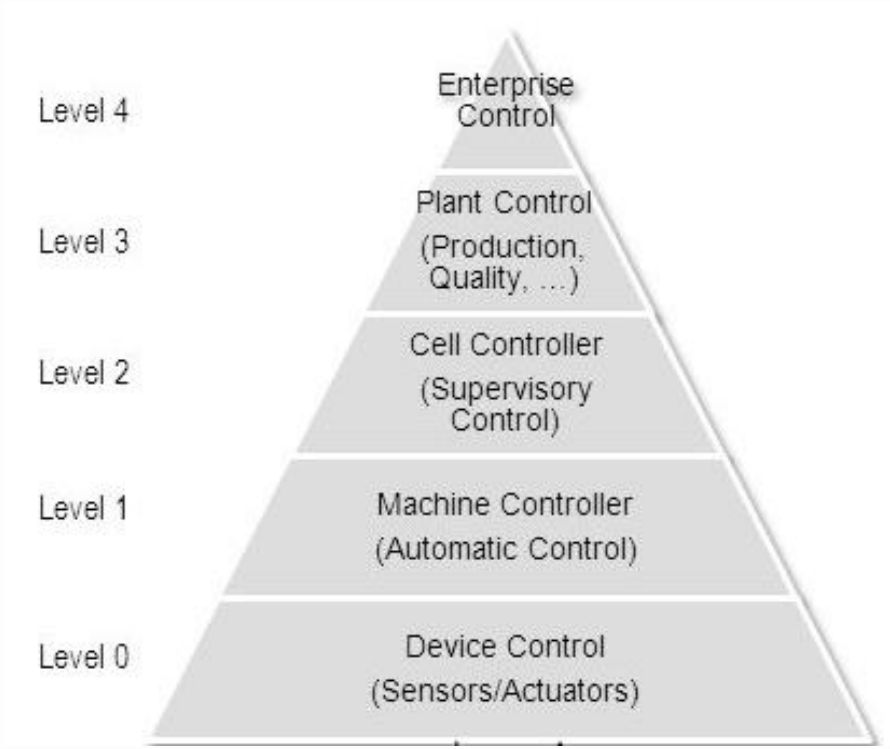
- PLC & DCS Systems
  - Some have built-in alarm systems, others need add-on software
  - Some systems have alarm routing and call-out capability built-in
  - Can be time consuming to setup and configure
  - Alarm Management software tools can help

Data Connectivity to Corporate/IT Systems

- Control Systems to do not run in isolation!

- Connectivity to remote systems is now a requirement
  - Reporting Systems
  - ERP
  - Process Scheduling
  - Billing/Ordering Systems
  - Accounting Systems
  - Maintenance Management Systems
  - Energy Management Systems
  - Etc.

- Many different protocols/methods
- Security between levels important



Pros/Cons of Traditional PLC Systems

- Pros
  - Hardware is usually less expensive
  - Very customizable, but lots of low level programming usually needed

- Cons
  - Significantly more programming effort required
  - Traditionally limited support for modules/templates/function blocks
  - Low level programming is needed for many functions
  - When integrating with the HMI, often two sets of tag databases are needed
  - Data Tag naming conventions can be inflexible

Pros/Cons of Traditional DCS Systems

- Pros
  - Integrated development environment
  - Lots of templates and reusable modules
  - Not much custom programming needed
  - Rapid programming
  - Configuration management tools for devices and instrumentation
  - More troubleshooting tools
- Cons
  - Traditionally more expensive to install
  - Can sometimes be hard to customize

Connecting IIoT Devices…..

- IIoT = Industrial Internet of Things

- IIoT Opportunities
  - Newly available detailed monitoring & control
  - Much more data and status information available
- IIoT Challenges
  - IIoT devices typically have non-traditional communication interfaces
  - Writing “device driver/connector” code can be difficult/time-consuming
  - Many PLC & DCS Systems don’t know how to handle IIoT data
- To successfully use IIoT devices, you need control systems that can support the communication interfaces/types that IIoT devices have
- Integrating IIoT into a PLC/DCS is easier with IIoT toolkits & modules

Introduction

Industrial Internet of Things (IIoT)

Broad range of potential uses

Significant development in automation systems

Leveraging data from dispersed enterprises

Proactive remote asset health monitoring

Improved collaboration

Faster configuration and commissioning

Benefits & Concerns of Implementing IIoT-capable PLCs

Specific Benefits

- Enabling businesses to leverage vast amounts of data
- Providing operations personnel with improved remote monitoring, diagnostic and asset management capabilities
- Enhancing data collection even in the most dispersed enterprises
- Improving decisions about the actual health of assets
- Reducing the time and effort for configuration and commissioning
- Minimizing the need to troubleshoot device issues in the field
- Bringing new production fields online faster, and
- Improving collaboration across the company.

Concerns

Safety and security

Connectivity

Compatibility with existing network technologies/devices

Next Generation of Controllers Utilizing IIoT

- Optimize operations and maintenance
- Open system benefits
- OPC UA open communication
- Multi-level and multi-platform
- IIoT-ready for cloud applications
- Investment protection
- Easier maintenance

Multi-vendor Challenges to Implementation

Challenges:

- Communication problems and errors
- Coordination and speed of implementation
- Amount of hardware and training

Conclusion:

- Reliability and integration can be increased using a single vendor
- One vendor can provide both DCS and PLC expertise
- Benefits result in reduced implementation cost and risk

Combined PLC/DCS Solution Reduces Implementation Risk and Cost

Project Engineering and Configuration

- Remote configuration and device monitoring
- Integrated HMI with a common view
- Universal I/O enables:
  - Late configuration & flexible design
  - Standardized cabinets
  - Reduced spares
  - Eliminated marshalling
  - Reduced footprint

Increasing Operator Effectiveness

- Leaner control room
- Common HMI for DCS and PLC
- Fewer stations, less hardware, less licensing and training
- Smaller footprint, easier maintenance
- Reduced cost over lifecycle

Collaboration and the Dispersed Enterprise

- Distribute information to the right people
- Enable a dispersed workforce
- Remote access to real-time, contextual data
- Decentralize decision-making

Cyber Security Embedded in PLC and DCS

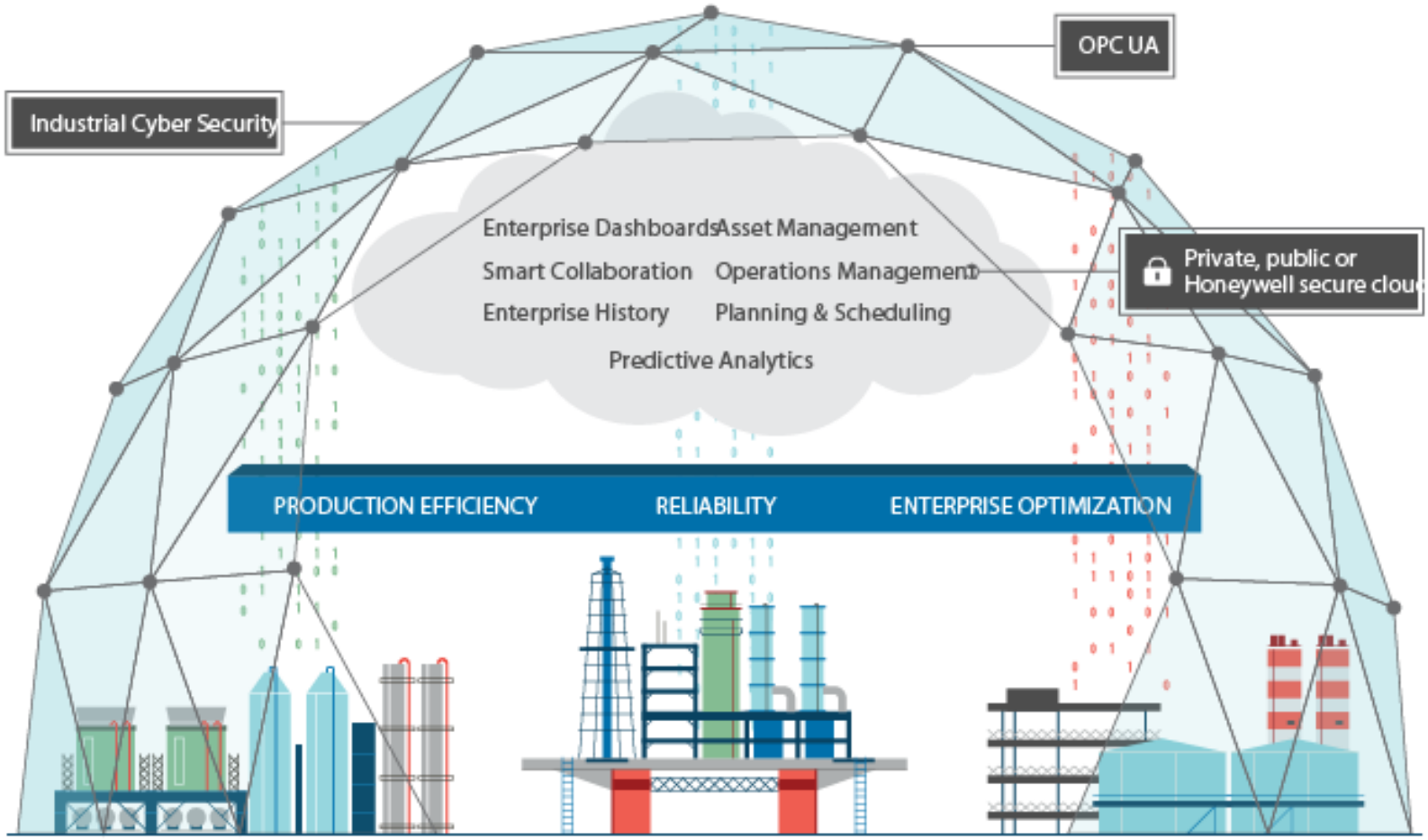
- Secure boot
- Built-in firewall
- Certified secure development lifecycle

Combined PLC / DCS Solution: Ultimate Benefits

- Minimized troubleshooting
- Early startup
- Remote diagnostics and health monitoring
- Long-term efficiencies

Manufacturer Integration between PLC and DCS Reduces Risk and Cost

Benefits of IIoT-enabled Technologies



Better connect your people, assets and processes to digitally transform your business.

1 Your assets become more reliable

2 You find new ways to run with greater efficiency

3 You optimize performance across your enterprise

Final Thoughts

- Control Systems are Layered - all the layers need to talk to each other
- IIoT Devices represent another “layer” in industrial control systems

- PLC, DCS and Hybrid systems all have individual Pros & Cons
- To pick best system for you, consider requirements & effort to maintain it

- When deploying a PLC or DCS system that will be using IIoT devices, it is usually preferable to have develop a system that provides the connectivity that these systems need – as part one complete package

- There are many PLC/DCS Systems available
- Pick the one that fits your specific needs and keep in mind effort needed to build/maintain it

Any Questions?

- Enter questions into the **Q&A box** on the right-hand side of your WebEx window.

- Unfortunately, with this many attendees, we cannot open up the phones for questions.

- If we miss your question or you would like to discuss a topic in more depth with one of the presenters, feel free to contact them directly.
  - Andrew Brodie: Andrew.Brodie@Honeywell.com
  - Graham Nasby: graham.nasby@grahamnasby.com

Goodbye

- We **thank you** for attending *Challenges of Multivendor Systems in Implementation of IIoT-ready PLCs*
- We sincerely hope you acquired useful information
- We would very much like to see you again in one of our web seminars

Please have a good day and a better week

All registrants will receive an email with the webinar recording link, as well as additional links for supporting information