T29 - Safety System Connectivity
Help Reduce Cost, Downtime, and Injuries
Agenda

- Market Trends - IIoT
- Why Integration Matters – IC&I
- SMART Assets and Connectivity
- Linking Technologies – GuardLink™
- Demo – CIP Safety and GuardLink™
Safety System Connectivity

Market Trends – IIoT
We are in another Industrial Revolution
Realizing The Connected Enterprise has become a business imperative
Business Trends

- IIoT will drive demand for smart components
  - Data for analytics
  - Better diagnostic information
  - Awareness of what is going on in and around a smart asset
  - Improved safety and security
- Smart components have been around for many years. Until recently their sales have been stagnant
  - Technology introduced before the rest of IIoT was ready
  - Recent discussions with our competitors shows they are also starting to see a pickup in smart component sales
  - Many of our customers are now talking about using smart components
Safety System Connectivity

Why integration matters – IC&I
Machine Safety Today
More than just Stop

- High plant availability
  Keep running when it is safe - “Ok to run!”

- Safe operator environment
  “Stop when demanded”

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“World-class safety, companies have the best safety performance and the best production performance”

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- 5%-7% Higher OEE
- 2%-4% Less Unscheduled Downtime
- Fewer Accidents (1/2000 vs. 1/111)
- Fewer repeat incidents
Machine Safety Today
Contemporary safety solutions

LOTO and guarding
Discrete Safety Relays
Modular configurable systems
Integration w/ PAC

Streamlined Architecture, Advanced Diagnostics, Greater Flexibility, Simplified Wiring
Smart devices and integration enable SMART machines

Real-time Data
Networked Production line

Information

Knowledge

Optimize

CONTEXTUALIZATION
Smart components

ANALYTICS
Predict bearing will fail in 10 hours

ACTION
More efficient process workflows

Operator Interface
Existing Line Stop Data
Added Safety Data
Root Cause Analysis

Corrective Active
Integrated Control and Information
SMART Assets

Enterprise Optimisation
Information Aggregation and Analytics
Network Infrastructure
Multi-Disciplined Control
Intelligent Assets

Common secure network infrastructure
Contextualized data
Safety System Connectivity

SMART Assets and Connectivity
Enabling SMART Machines
Knowing what happened - Smart devices and smart control

SMART Devices - Avoidance of unplanned downtime due to intermittent operations.

SMART Control and Integration – Transfer of diagnostics into actionable information

- Where
- What
- How
Enabling SMART Machines
Knowing what happened - Smart connectivity across all platforms

- The infrastructure to support the Connected Enterprise is EtherNet/IP, however not all products can support this due to:
  - Size of EtherNet/IP circuitry is prohibitive in many cases
  - Amount of information from a device is minimal
  - Cost of Ethernet connectivity is too high
  - Power consumption requirements would make the product much larger

*Linking technologies were created to allow these devices to contribute to The Connected Enterprise*
Smart Safety for Smart Manufacturing
Linking Technology is the enabler of the Connected Enterprise
## Rockwell Automation Portfolio

<table>
<thead>
<tr>
<th></th>
<th>Controllers</th>
<th>Integrated Safety Controllers</th>
<th>Smart Sensors</th>
<th>Smart Safety Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockwell Automation®</td>
<td>#2 market share</td>
<td>Full line of large controllers and a substantial move into small controllers with the new GCMX</td>
<td>IO-Link masters and expanding line of photo, condition monitoring, and identification</td>
<td>Starting to build out a line of smart safety components with GuardLink™</td>
</tr>
<tr>
<td>Siemens</td>
<td>#1 market share</td>
<td>Full line from large to micro controllers</td>
<td>IO-Link masters and hubs. Sold the sensing business to P&amp;F in 2010</td>
<td>NA</td>
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<tr>
<td>Schneider</td>
<td>#4 market share</td>
<td>Available only with Quantum</td>
<td>Limited portfolio</td>
<td>NA</td>
</tr>
<tr>
<td>Omron</td>
<td>#5 market share</td>
<td>Slice style controller in the NX platform</td>
<td>IO-Link masters and large line of smart sensors</td>
<td>Not at this time</td>
</tr>
</tbody>
</table>

**RA opportunity to differentiate through self and system-aware features combined with a strong controller, sensing and safety component portfolio. We will be the first to introduce smart safety components in the market.**
Scalable Safety Solution
From Relays to Integrated Safety

Allowing customers to select the level of integration and size required for the application
Safety System Connectivity

Linking Technologies – GuardLink™
GuardLink™ is a linking technology that enables smart safety components to share real-time data with the superior control solution where a direct integration over a network is not achievable due to space and cost constraints of the devices.

GuardLink seamlessly configures the devices in a daisy chain topology automatically for communicating information with the GuardLink master.
• Device Level Diagnostics similar to IO-Link
• 32 Device per link
• 1000 m link distance (max 30 m between devices)
• Trunk and drop topology
  • Uses standard 4 (Trunk) or 5 (Drop) conductor Patchcords
• Support Safety, Diagnostics, Remote reset and Lock command over one cable
• Plug and play, no configuration required
• TÜV certified PLe

GuardLink™ enables series connections and diagnostics
GuardLink
Use Case – Faster Time to Market

- Reduced landed wires
  - When using Taps, the GuardLink™ trunk is four conductors instead of five conductions in traditional series connection systems
  - When using Terminal Blocks, traditional series connection devices are eight conductor and GuardLink Devices are five conductor
  - **Reduction is 20% to 38% in number of wires being terminated**
- Remote reset reduces troubleshooting time
  - When installing a guard locking device if a device faults due to misalignment and attempting the lock, in a traditional system you must cycle power to reset the faulted guard locking device
  - When a device faults in a GuardLink system a simple reset command can be sent to remove the fault from the device
  - **No power cycle required and system will indicate which device faulted and why**
Maintaining Safety Ratings up to PLe

Recent changes in EN ISO 14119 prevent series wiring from achieving the highest levels of machine safety because of the potential for fault masking (Diagnostic Coverage).

GuardLink™ maintains PLe

A machine builder shipping into Europe must provide a technical file showing that a reduced safety level is appropriate for the application.

<table>
<thead>
<tr>
<th>Number of frequently used movable guards¹</th>
<th>Number of additional movable guards</th>
<th>Masking probability</th>
<th>Diagnostic Coverage</th>
<th>Maximum Achievable PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2 to 4</td>
<td>Low</td>
<td>≥ 60 %</td>
<td>PL d</td>
</tr>
<tr>
<td></td>
<td>5 to 30</td>
<td>Medium</td>
<td>≥ 60 %</td>
<td>PL d</td>
</tr>
<tr>
<td></td>
<td>&gt; 30</td>
<td>High</td>
<td>&lt; 60 % (none)</td>
<td>PL c</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Low</td>
<td>≥ 60 %</td>
<td>PL d</td>
</tr>
<tr>
<td></td>
<td>2 to 4</td>
<td>Medium</td>
<td>≥ 60 %</td>
<td>PL d</td>
</tr>
<tr>
<td></td>
<td>&gt; 5</td>
<td>High</td>
<td>&lt; 60 % (none)</td>
<td>PL c</td>
</tr>
</tbody>
</table>

¹switching frequency greater than once per hour

European machines moving toward PLe solutions as standard

• Less documentation and analysis required when using PLe
# GuardLink

## Use Case – Lower Total Cost of Ownership

<table>
<thead>
<tr>
<th>Taps</th>
<th>Blocks</th>
<th>GuardLink™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostics</td>
<td>None</td>
<td>Device Identification</td>
</tr>
<tr>
<td>Hardware Cost*</td>
<td>$1890</td>
<td>$2820</td>
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</tbody>
</table>

* List price for eight device single zone system (Relay, I/O, cables, taps and blocks)
GuardLink

Use Case – Improved Asset Utilization

Seeing the details of why a system is stopped versus normal operation can provide critical insight into problems.

<table>
<thead>
<tr>
<th>Access Point</th>
<th>Anticipated Exposure</th>
<th>Current Month Exposure</th>
<th>6 Month Average</th>
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</thead>
<tbody>
<tr>
<td>Access Point 1</td>
<td>&lt; 1 per month</td>
<td>2</td>
<td>2.3</td>
</tr>
<tr>
<td>Access Point 2</td>
<td>&lt; 1 per month</td>
<td>0</td>
<td>1.1</td>
</tr>
<tr>
<td>Access Point 3</td>
<td>1 per month</td>
<td>44</td>
<td>38</td>
</tr>
<tr>
<td>Access Point 4</td>
<td>1 per month</td>
<td>12</td>
<td>0.9</td>
</tr>
<tr>
<td>Access Point 5</td>
<td>1 per week</td>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td>Access Point 6</td>
<td>1 per week</td>
<td>14</td>
<td>2.7</td>
</tr>
<tr>
<td>Access Point 7</td>
<td>1 per shift</td>
<td>427</td>
<td>561.2</td>
</tr>
<tr>
<td>Access Point 8</td>
<td>1 per shift</td>
<td>77</td>
<td>91</td>
</tr>
<tr>
<td>Access Point 9</td>
<td>&gt; 1 per shift</td>
<td>1836</td>
<td>867</td>
</tr>
<tr>
<td>Access Point 10</td>
<td>&gt; 1 per shift</td>
<td>0</td>
<td>655</td>
</tr>
</tbody>
</table>
Safety System Connectivity

Demo – CIP Safety and GuardLink™
After completing this lesson you should be able to:

- Articulate the value of the GuardLink™ System which is connected to the Controller over Ethernet
- Understand and explain the benefit of the GuardLink System.
- Demonstrate how to configure the GuardLink System via the Add-on Profile in Studio 5000® software
What’s New?
Guardmaster Safety Relay DG

Dual GuardLink™ Guardmaster® Safety Relay

- Supports implementations of two safety circuits
  - GuardLink™ system
  - EMSS or OSSD devices
- Local controls to easy select and configure the safety related function
  - A total of the 21 Functions, among others
    - Single input with optional time delay
    - Dual input with optional time delay
  - Dual input with time delay on one Output (Safe Torque Off - Stop Cat 1)
  - Device Reset
- Configurable Multipurpose terminals
  - Safety input, Safety output and standard signals
- Relay Outputs to drive higher loads
- Connectivity to network interface via Optical Link
- Support of SWS to cascade multiple safety relays
What’s New?
Guardmaster Safety Relays (GSR) 440R-ENETR Series B

E/IP Interface for Guardmaster® Safety Relays

- Add-on Profile for Studio 5000 Logix Designer® software
  - Monitor Devices on the link
  - Dynamic and Automatic Tag generation
  - Access Relay logic and status data
- 2-port embedded switch
  - Supports linear, star and DLR topologies
- Support up to six Relays
  - No wiring required, data is communicated over optical link
GuardLink™ Tap and adapter for Safety Input devices

- Support all Safety input devices in two models
  - 5 or 8-pin M12 for sensor input
- Provides device location, status and Auxiliary to GuardLink™ GSR Relay
- Supports guard locking devices
- Auto detects between OSSD or EMSS inputs
- Two bright indicators for Device and Link communication status
- Compact Design with 40 mm width to fit on standard aluminum profiles
- TÜV Approved PLe, SIL 3, Cat 4 Rated
- IP65/IP67 Environmental rating
Why Was GuardLink Developed?

- GuardLink™ is a linking technology that enables smart safety components to share real-time data with the superior control solution where a direct integration over a network is not achievable due to space and cost constraints of the devices.
- GuardLink seamlessly configures the devices in a daisy chain topology automatically for communicating information with the GuardLink master.
- The products will be standardized on M12 Quick disconnect to avoid wiring faults and reduce wiring costs.
Learning Objectives
SafeZone 3 Laser Scanner

After completing this lesson, you should be able to:

- Articulate the value of CIP Safety over EtherNet/IP connectivity for the SafeZone™ 3 laser scanner
- Explain the new features of the SafeZone™ 3 scanner as compared to the current laser scanner portfolio
- Demonstrate how to configure the SafeZone™ 3 laser scanner via the Add-on Profile in Studio 5000® software
What’s New?

- Premier integration with Studio 5000® software - the SafeZone™3 laser scanner is programmed in the same environment as GuardLogix® Controllers
- Next generation of time of flight distance measurement: HDDM
  - The number of pulses per scan cycle has increased dramatically with this new technology, leading to better immunity to dust and ambient light interference
- Supports up to two simultaneously monitored zones, with two safety outputs
- Supports DLR topology with two Ethernet connectors located on the product
Why Was the SafeZone™ Laser Scanner Developed?

- Designed to bring safety laser scanners more completely into The Connected Enterprise
- Provides customers easier integration and set up for safety laser scanner applications
- Increases the functionality of our laser scanner line, offering new measurement technology, matching out longest ranges, and increasing the field of view of our multizone scanner offerings
After completing this lesson, you should be able to:

- Articulate the value of CIP Safety over EtherNet/IP connectivity for the MAB
- Explain the new features of the MAB with CIP Safety as compared to the current MAB portfolio
- Demonstrate how to configure the MAB laser scanner via the Add-on Profile in Studio 5000® software
What’s a 442G Multifunctional Access Box?

- An integrated guard locking and access control device
  - Guard Locking: to prevent access to a running machine
  - Access control: provides a means to control the operation of the machine and manage access into the safeguarded area.
- A high holding force, tolerance to guard misalignment (+/-5 mm), and an escape release option make the 442G an ideal choice for safeguarding large guard doors typically used in applications where full body access to the safeguarded area is required.
- Meets the highest levels of safety
  - Rated PLe, Cat 4 EN ISO 13849-1, for door interlocking and guard lock monitoring
  - Uniquely coded handle assembly ensures the highest level of tamper resistance in accordance with the requirements of ISO 14119
What’s New?

- The portfolio was expanded in November 2016 with the introduction of the 442G Multifunctional Access Box with CIP Safety over EtherNet/IP

- All types are available in Power-to-Release or Power-to-Lock

- All types are suitable for left- or right-hand swinging or sliding guard doors

Discrete-wired models

Ethernet models
What’s New?

- New Ethernet Model with Mode Selector Switch
  - 2-position switch, lockable in one position
  - safety rated
  - Target Q1FY18
- Emergency Release Knob
  - (442G-MABAKNOB)
  - allows for unlocking the guard door in the event of unforeseen or uncommon circumstances
Key Features and Benefits

- Enhanced diagnostics help simplify troubleshooting
  - door position, bolt position, lock status, fault status
- Provides an integrated solution for guard locking and access control
  - Reduced hardware costs
  - Simplified installation
  - Discrete MAB is good, Ethernet version is better
Thank You!