Rockwell Automation

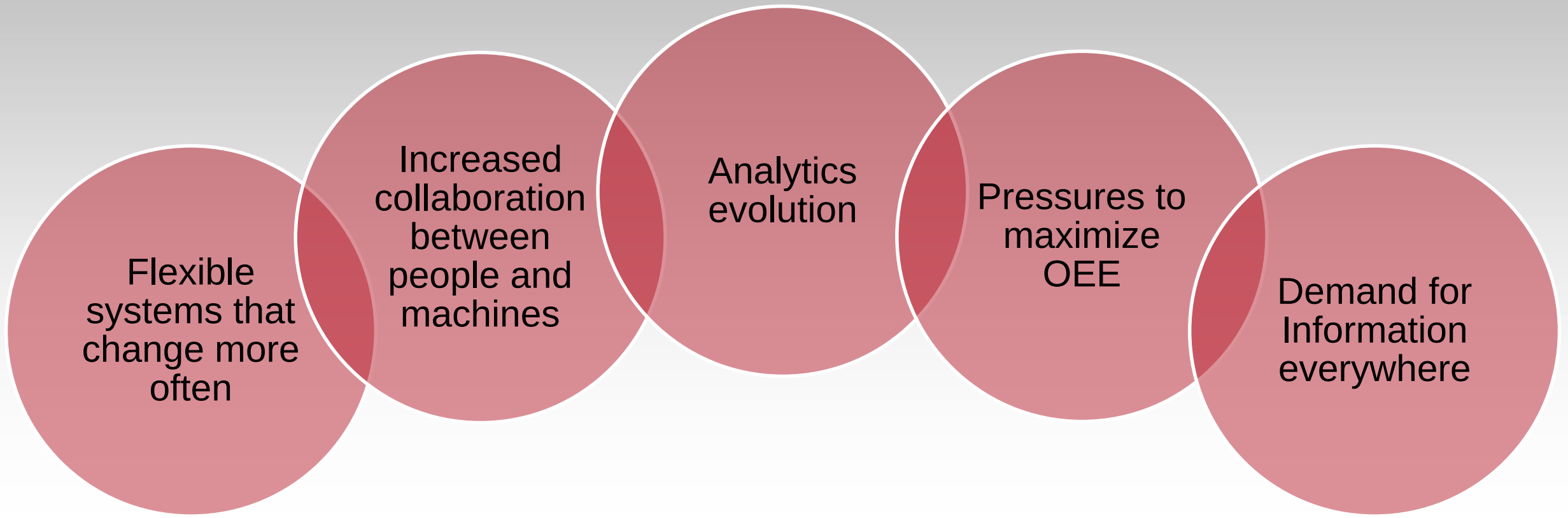
Innovation & Technology Forum

Smart Devices: Helping Design Operate and Maintain The Connected Enterprise: T09

Peter Madarász

Commercial Engineer

The market is changing



THE CONNECTED ENTERPRISE

ROCKWELL AUTOMATION's VISION FOR SMART MANUFACTURING

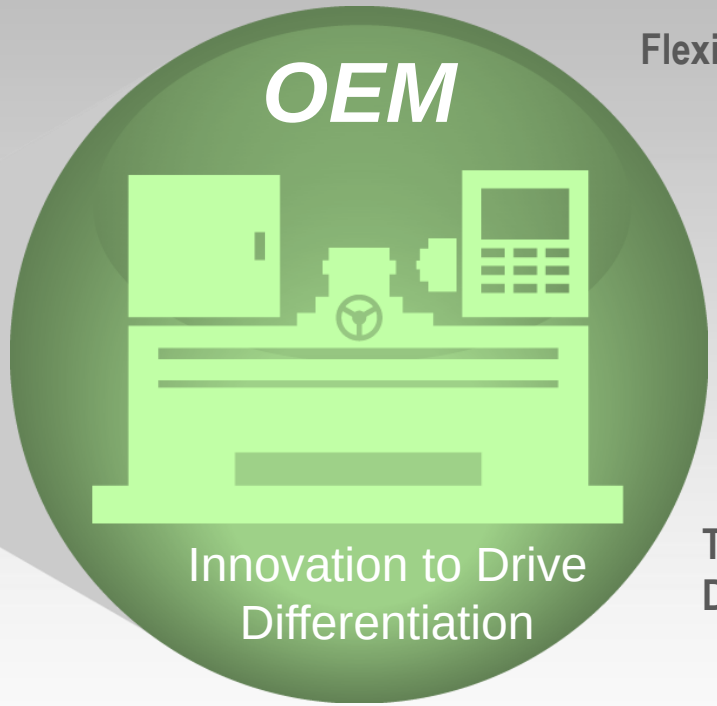
BUSINESS DRIVERS

Faster Time to Market

Improved Asset Utilization

Enterprise Risk Management

Lower Total Cost of Ownership



Flexibility

Integration & Standardization

Performance/OEE

After Market Service & Support

Total Cost to Design, Develop & Deliver

SMART MANUFACTURING

SMART MACHINES & EQUIPMENT

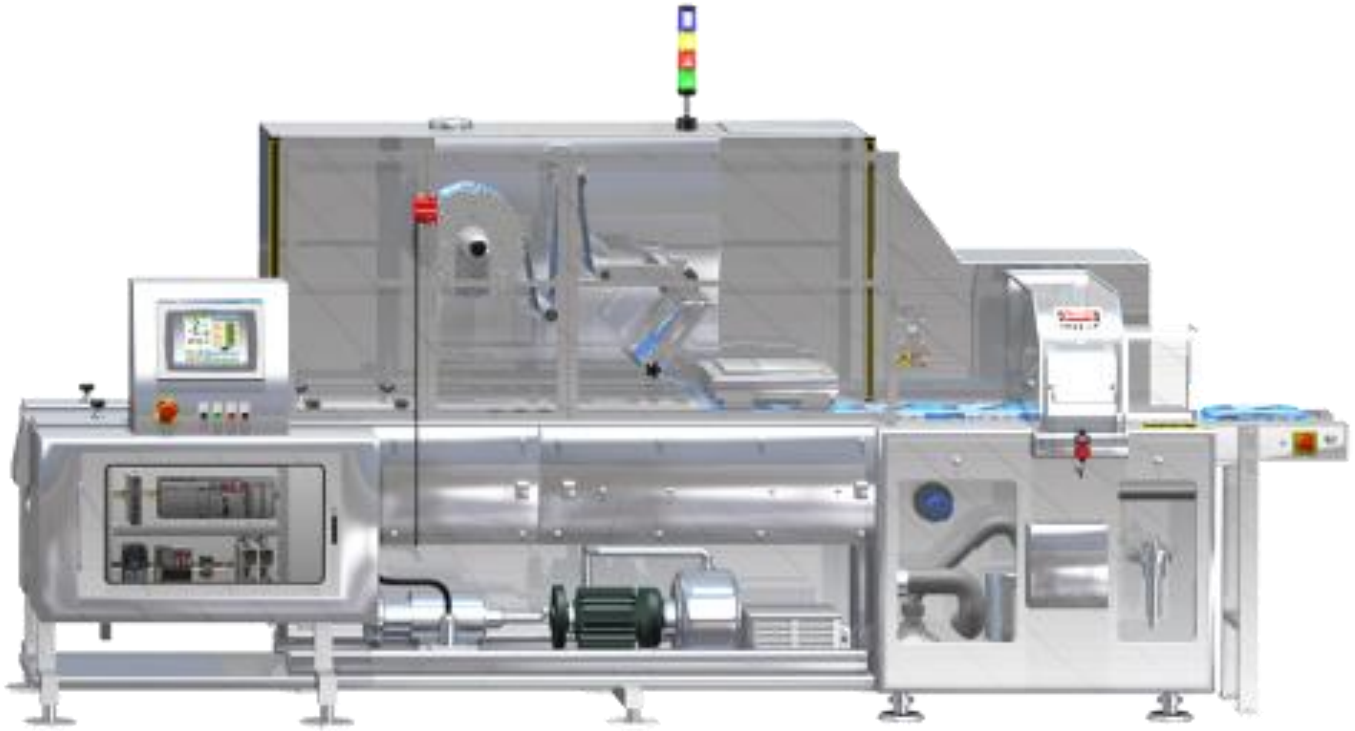
SMART DEVICES

Variable Frequency Drives

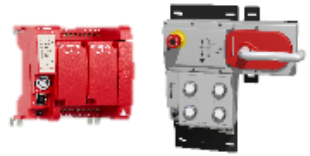
PowerFlex® AC Drives

Servo Drives

Kinetix® Motion



Smart Safety



Guardmaster® Safety

Smart Sensors

Photo, Pressure
& Proximity Sensors

Condition Monitoring

Dynamix™ 1444 Condition Monitor

Smart Motor Starters

SMC™ Soft Starter

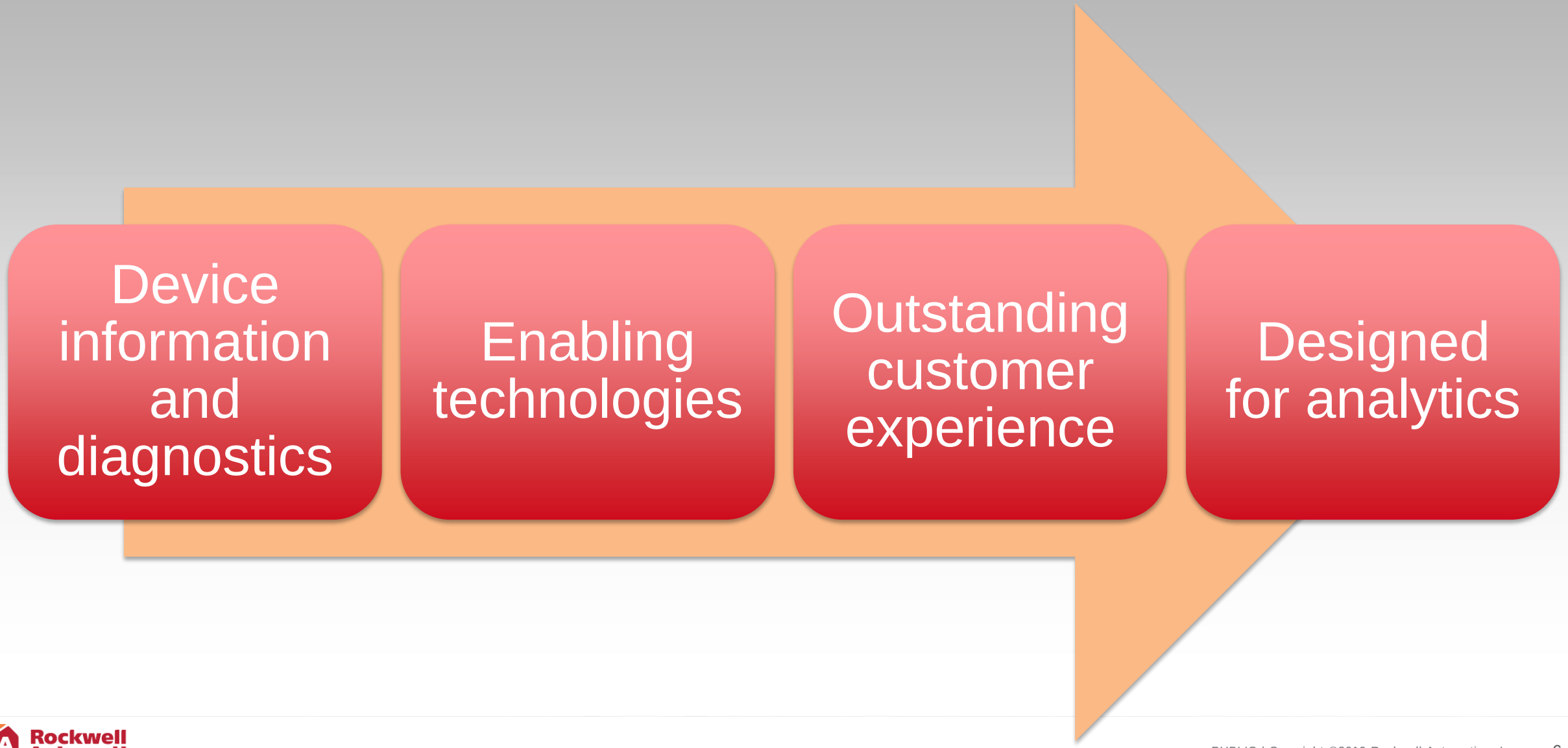
Smart Motor Protection

E300™ Overload Relays

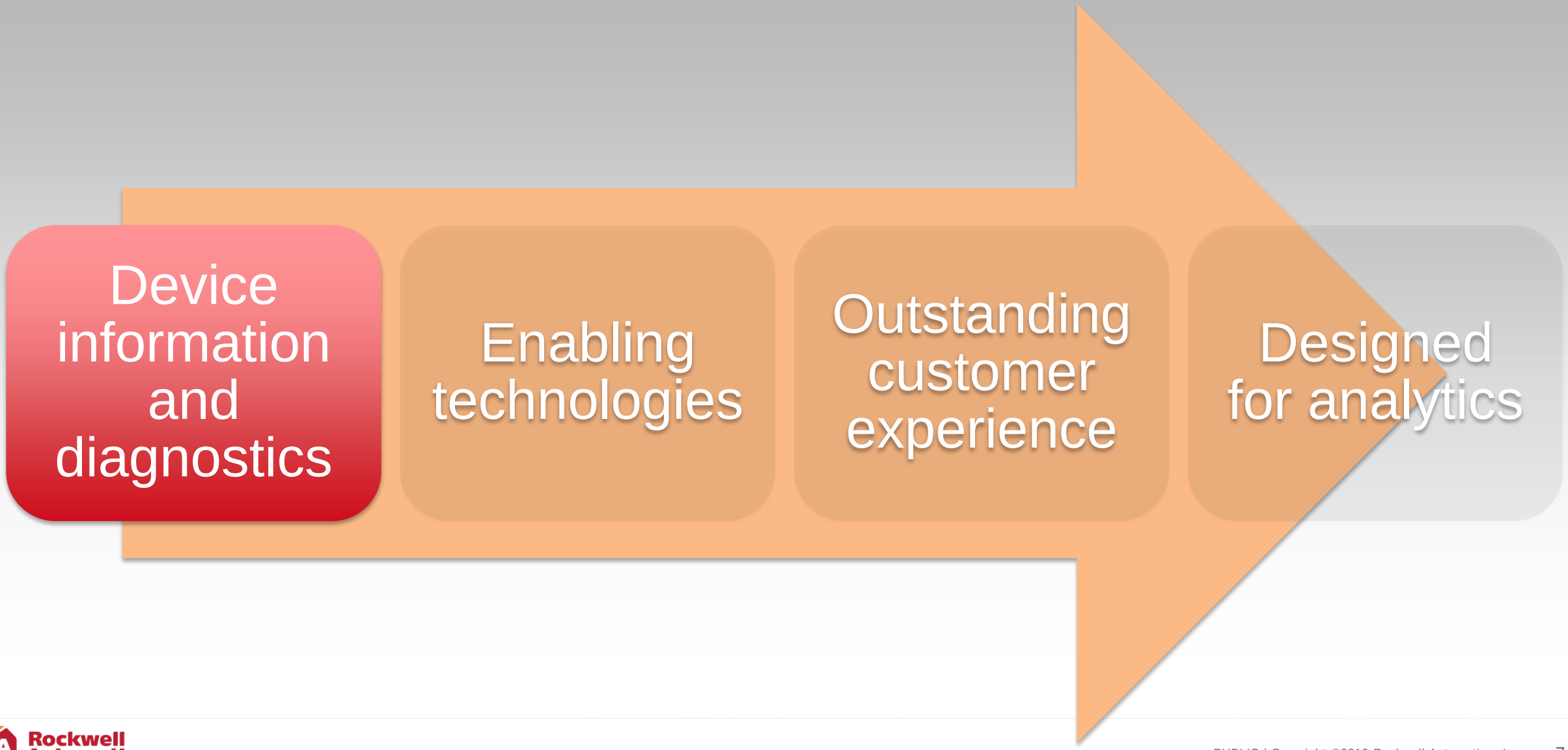
Smart Power Monitoring

PowerMonitor™ Energy Monitor

What makes Devices Smart?



What makes Devices Smart?



Device Information and Diagnostics

- The best information is the one created at the source
- The more diagnostics/device information the higher the value
  - Integrated device-specific warnings and alarms
  - Device-specific tags and user-friendly configuration
  - Application-based diagnostics (duty cycle, power usage, target drift, etc.)
  - Smarter linking technologies
- Core enabler of frictionless customer experience

The Connected Enterprise

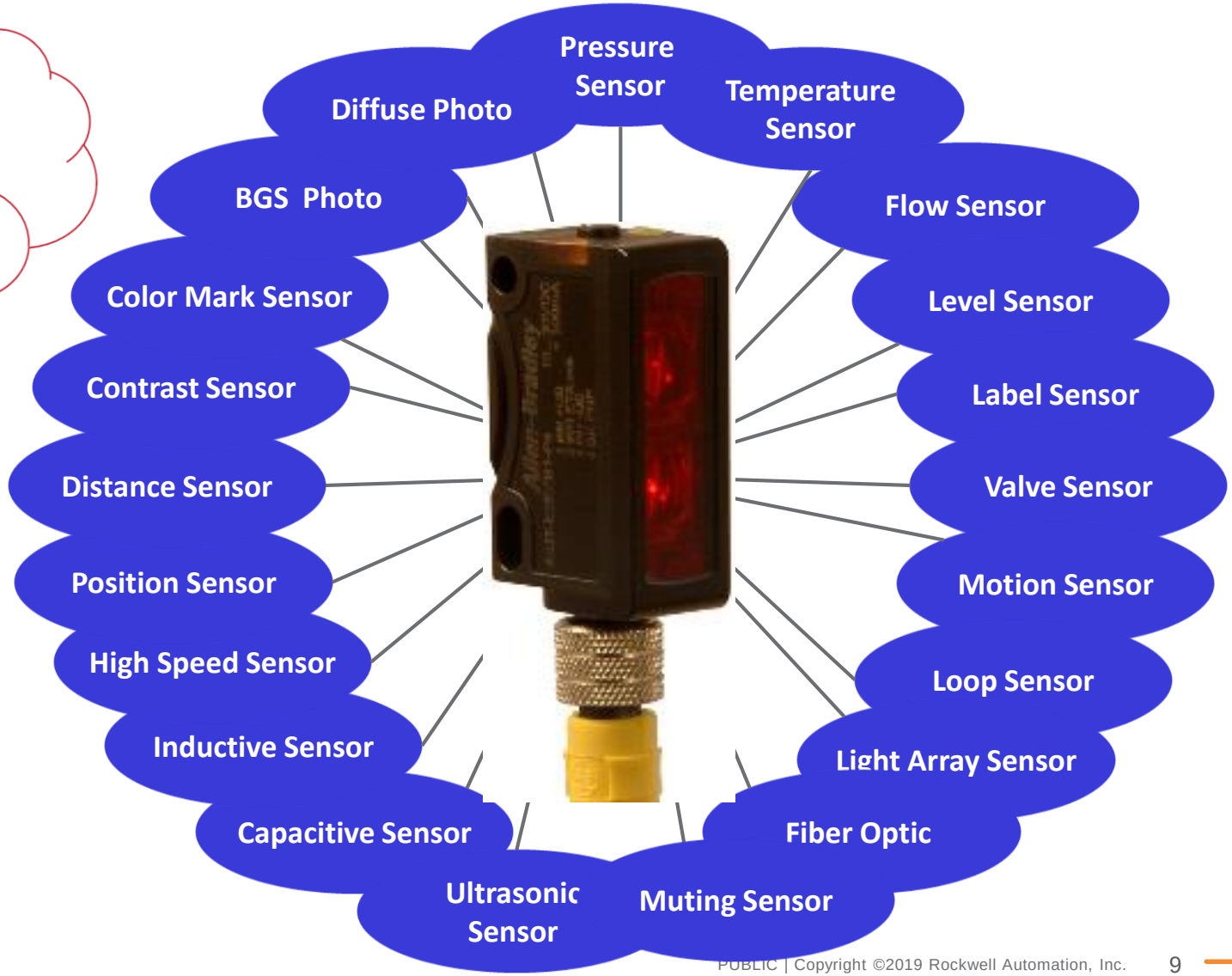
We continue to improve the portfolio of Smart Devices so they provide enhanced device and process-specific information and diagnostics

Which Sensor is the most critical ?

Is there a sensor problem we are running into ?

Is the right setup loaded ?

- What is the actual sensor status they are operate right now !
- How can we identify if a sensor is working on the edge?
- Conventional sensors do not offer any diagnostic data nor parameter data to be exchanged with a controller



With Smart Sensors available for pressure, temperature, distance, motion, level and flow - it is possible to get a comprehensive view of your process. Knowledge of current sensor situation and status also ensures timely identification of any type of potential sensor issue.

Sensors – The Eyes & Ears of the Factory !

Cost of Sensors

- Multiple sensing technologies to set up and maintain
- Re-Teaching for every production change over
- Analog signal converting
- Replacement of damaged sensors
- Installation and wiring
- Machine commissioning
- Failure analyze
- Many sensor variants

Why Sensors fail

- Margin getting low due to dust
- Mechanical damages during production
- Wrong setup or unintended teach
- Cable break
- Swapped sensor cable
- Material or target change during a production change over
- Contamination
- Component failure
- Short circuit

Cost of downtime

- Loss of production
- Manufacturing scrappage
- Establishing cause of failure (Mechanical/Electrical)
- Sensor replacement costs
- Safety issues
- Impact on other equipment

Increase productivity

- Reducing unplanned downtime improves productivity
- Be in control of your production process
- Make fact based decisions with advanced diagnostic information
- Faster production change over due to multiple sensor profiles
- Faster device change over due to auto device configuration

Maintenance options

- Advanced diagnostic information
- Preventative not reactive maintenance
- Planned downtime possible
- Be in control of your plant
- Reduced maintenance costs

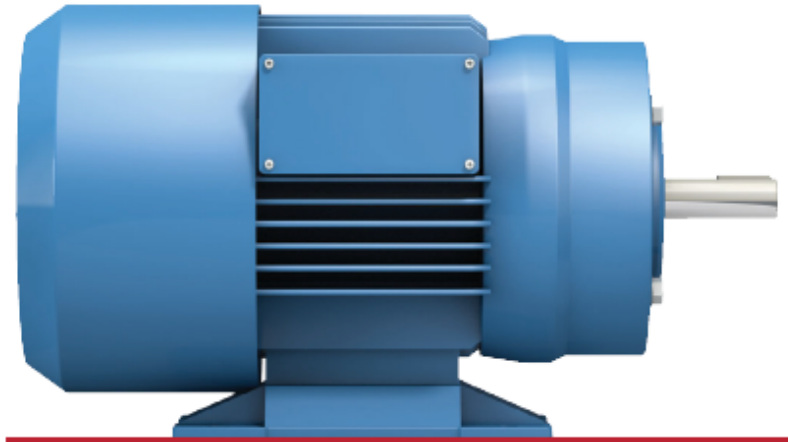
Integrated Smart Sensor Solution provides min. 5-10% production increase

Smart Motor Control

75%

of motor failures could be prevented by appropriate protection measures

Source: IEEE Petro-Chemical Paper PCIC-94-01



- % Thermal Capacity Utilisation
- Trip / Warning Histories
- Current
- Voltage
- Time to Trip
- Time to Reset
- Energy & Power
- Number of Starts
- Operational Hours

Today's smart Approach

- Seamless communication and system visibility for increased performance and flexibility
- Control & maintain motor performance through smart equipment and networks
- Reduce unplanned downtime with alarms and advanced diagnostic information
- Monitor energy consumption
- Simplify troubleshooting and reduce startup times

Smart Overload Relay

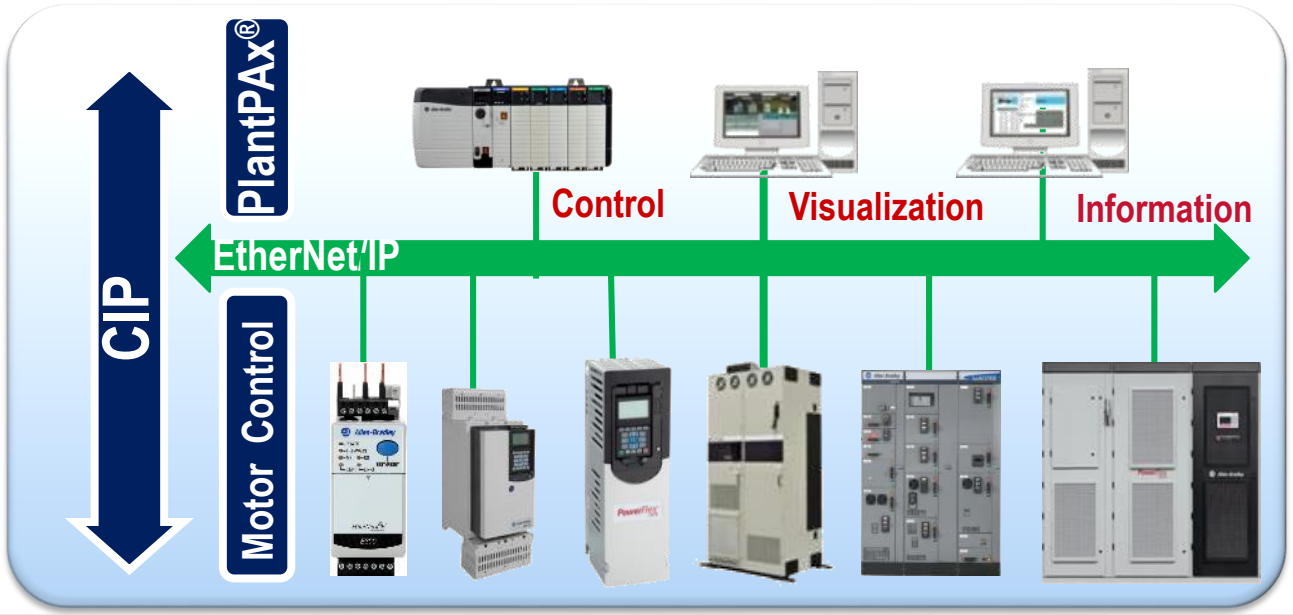
- Traditional Overload Relay
  - Overcurrent condition trips relay, helping to protect the motor from damage
  - Production is down – purely reactive maintenance
- Smart Overload Relay
  - Primary function is the same
  - Network connection allows enhanced diagnostics

Shift from reactive maintenance to predictive maintenance

Intelligent Motor Control

The E300 is fully integrated into the Integrated Architecture®

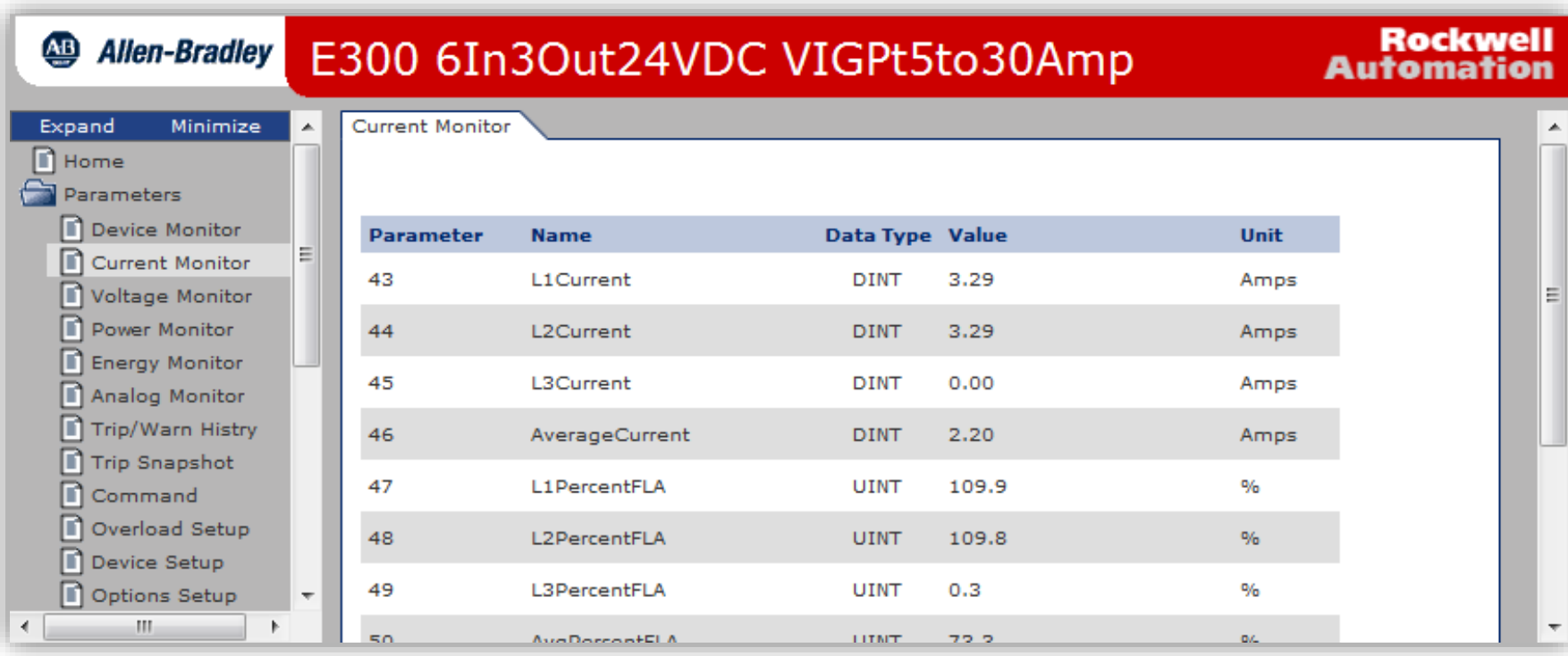
- Network connectivity - *Native EtherNet/IP and DeviceNet reduces hardware and engineering cost*
- Integrated into Logix – *Device profiles and faceplates reduce engineering time and project development*
- Automatic Device Configuration – *Reduces time to repair*



Simultaneous real-time control, configuration, and data acquisition

Motor Diagnostics

- The E300 provides a wide variety of diagnostic information to monitor motor performance and proactively alert users to potential operational issues
- This information can trigger either manual or automatic intervention before the occurrence of an unplanned shutdown
  - Voltage, Current, and Energy
  - CIP Energy Enabled
  - Trip / Warning Histories
  - % Thermal Capacity Utilization
  - Motor Winding Temperature
  - Trip Snap Shot
  - Time to Trip
  - Time to Reset
  - Operational Hours
  - Number of Starts



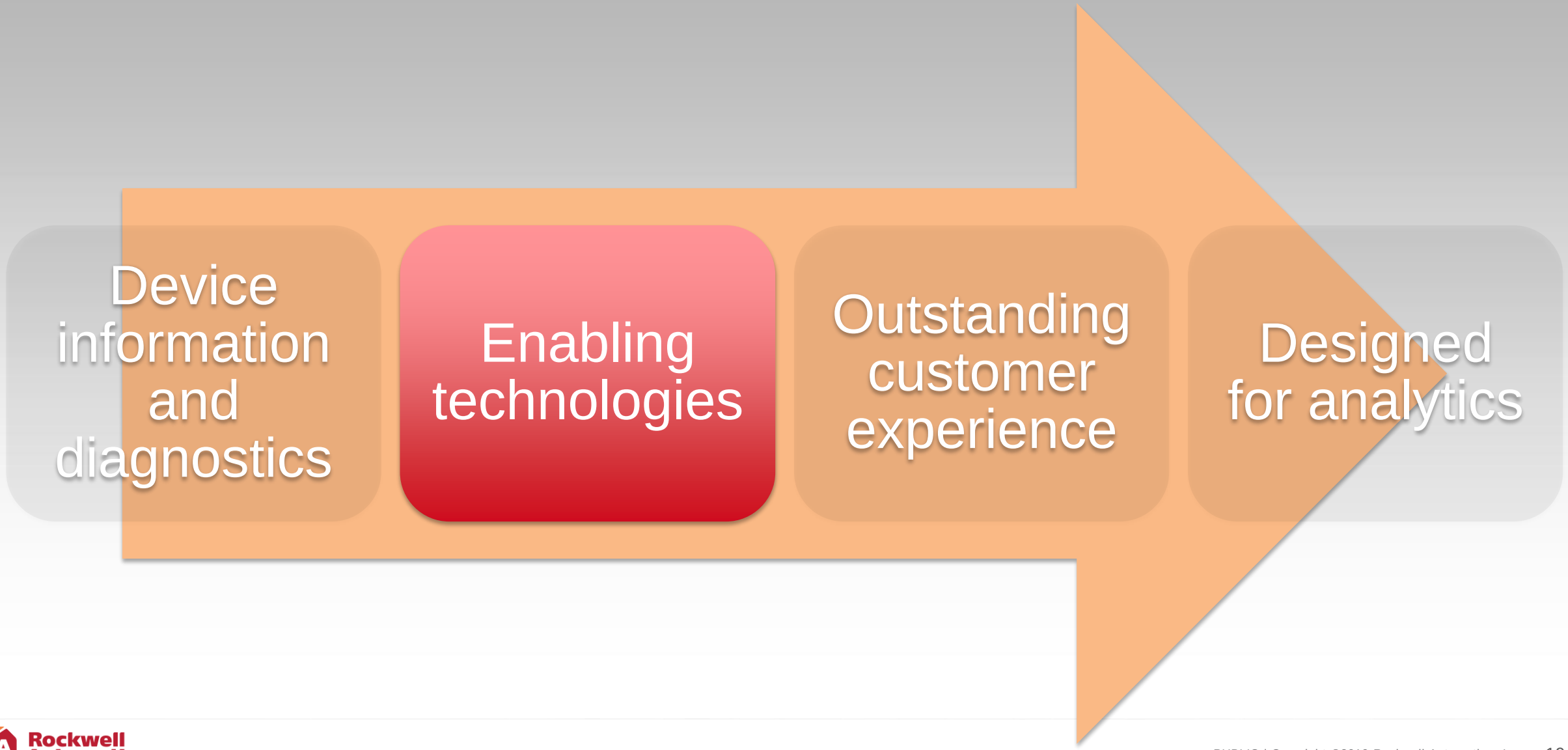
E300 Communication Modules

- Consists of Three Styles
  - EtherNet/IP
  - DeviceNet
  - *Parameter Configuration Module (E200/PCM)*

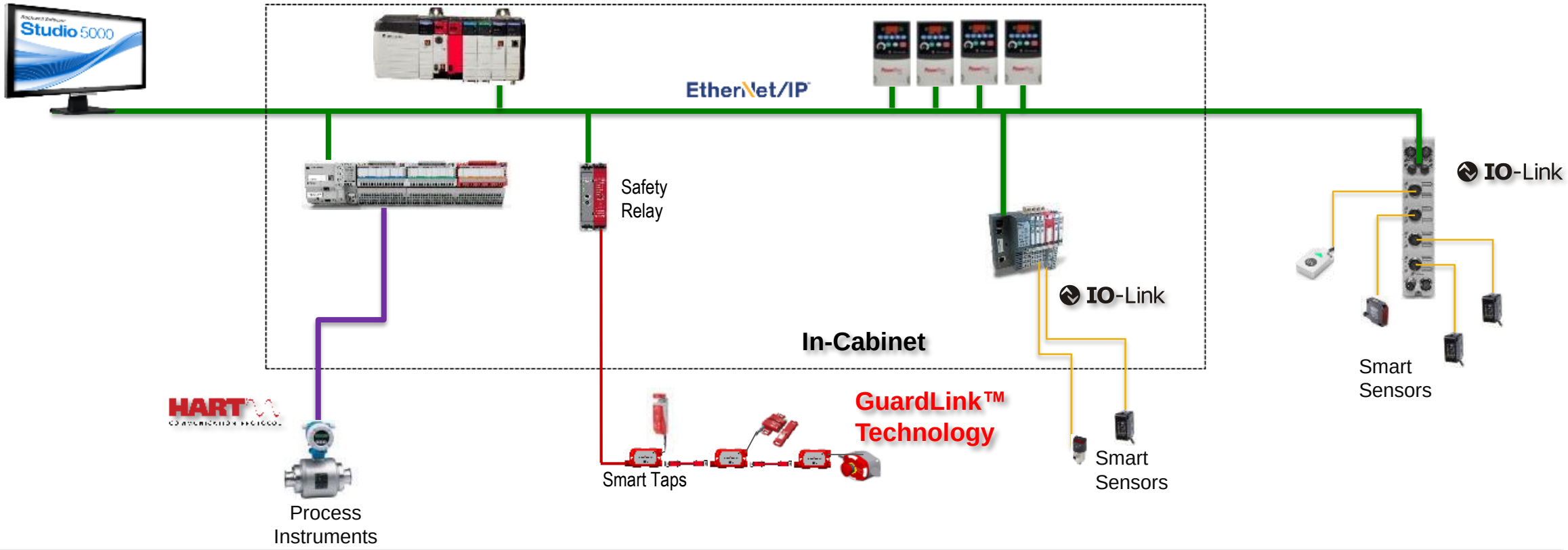
Lack of granular safety system diagnostics leads to unnecessary machine downtime

Diagnostics are critical for quickly identifying the reason for the demand on the safety system as well as guiding operators through a quick and effective recovery

What Makes Devices Smart?

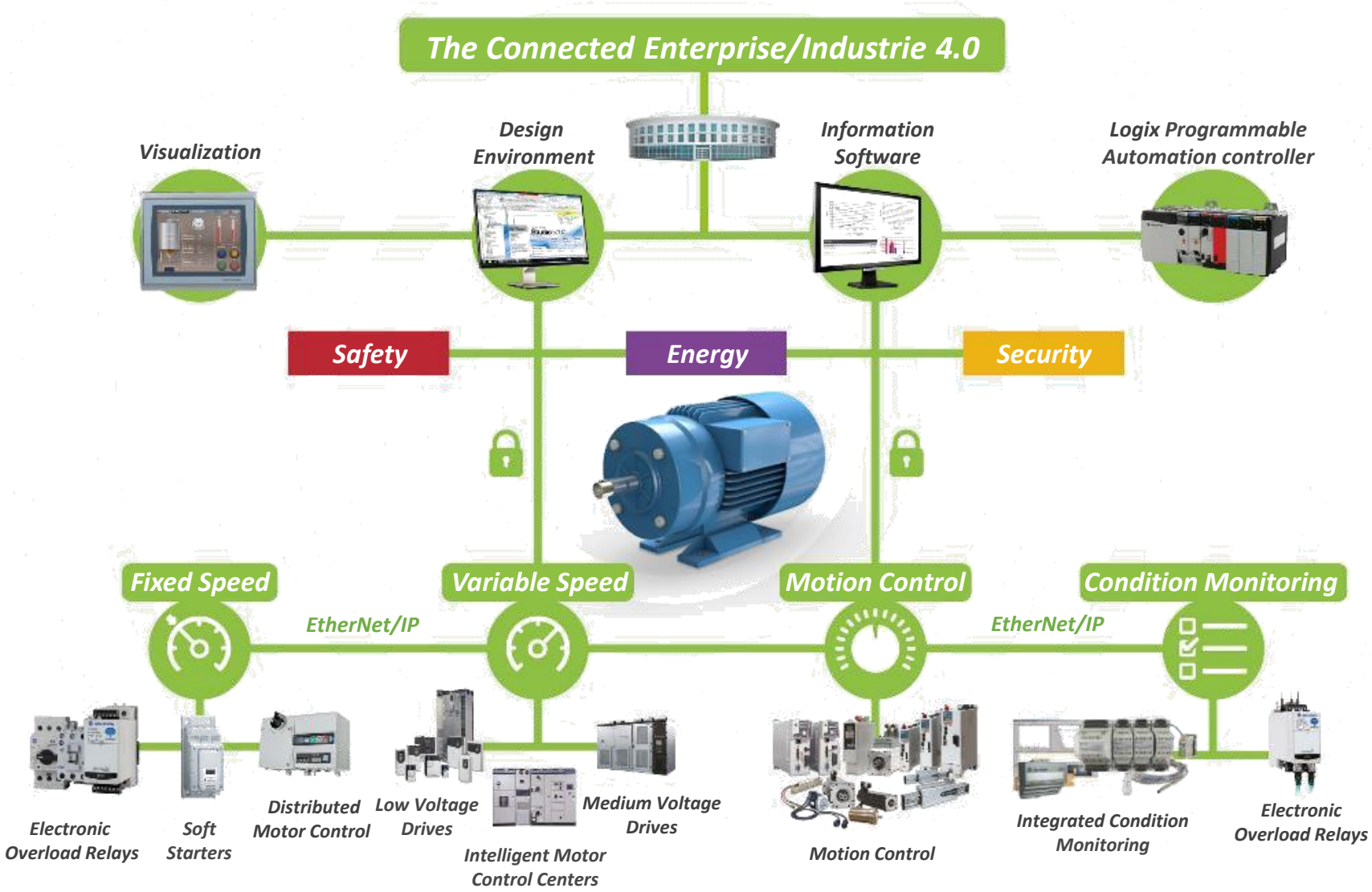


Smart Device Connectivity

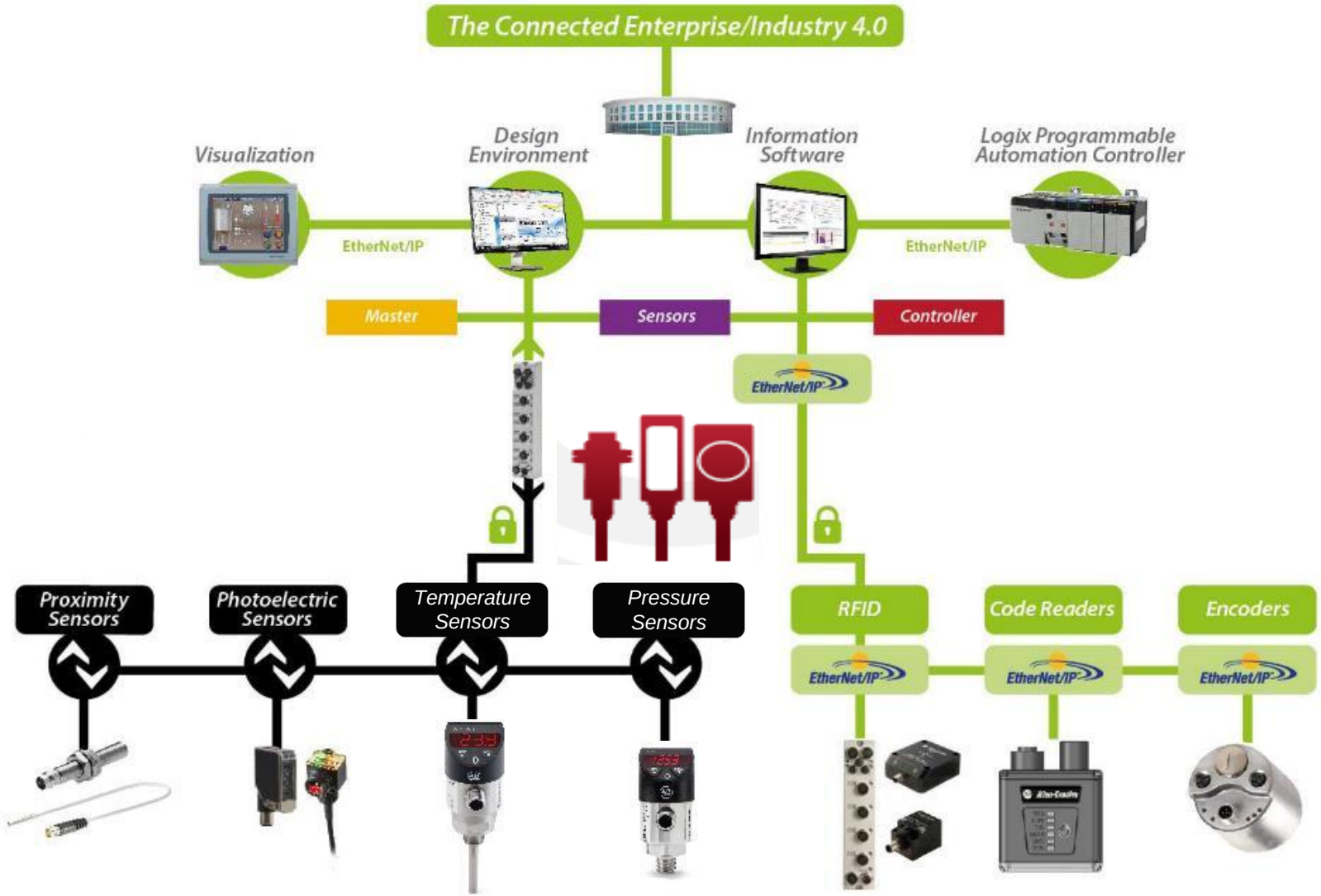


Increased value integrating Smart Devices to
The Connected Enterprise

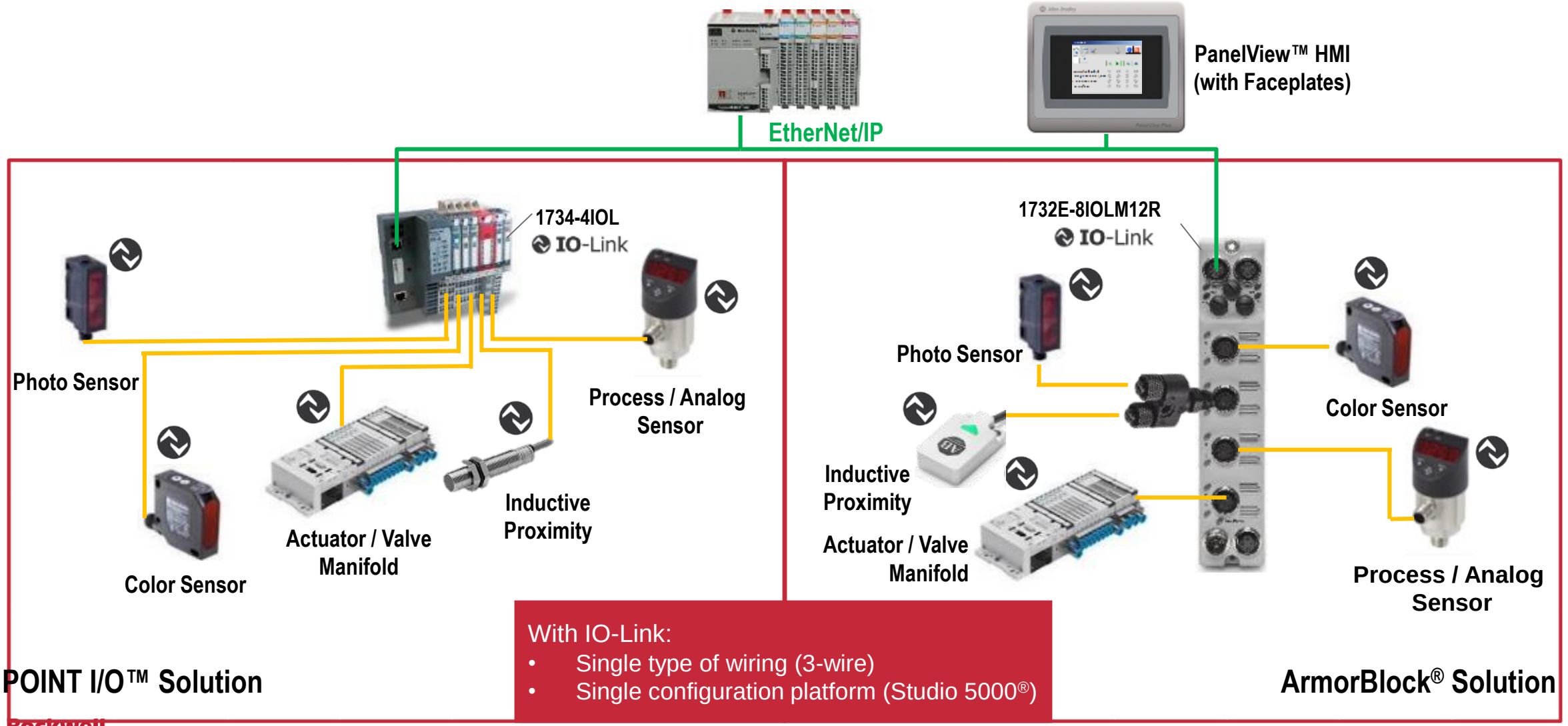
Smart Motor Control



Smart Sensors



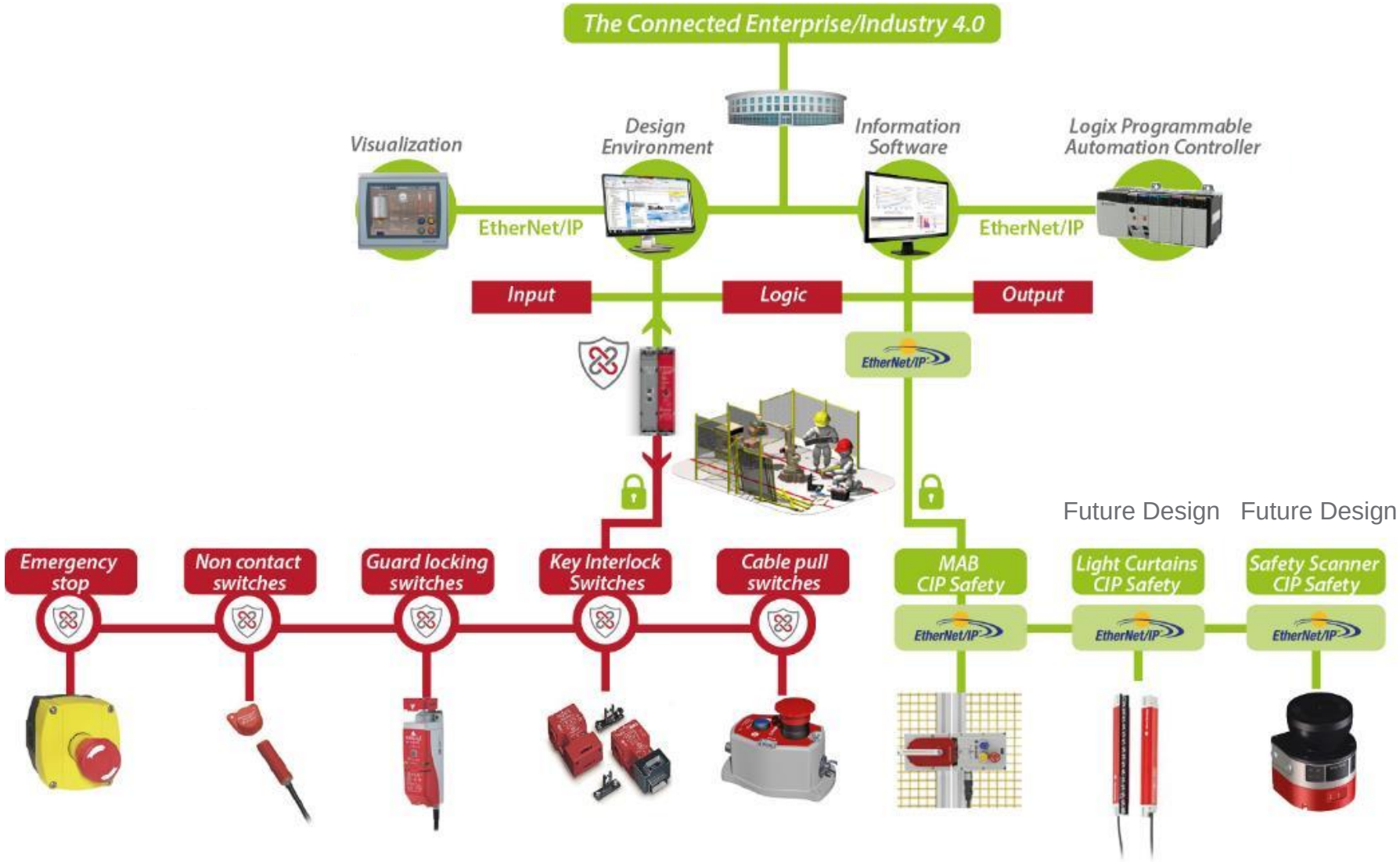
Smart Sensing Architecture



With IO-Link:

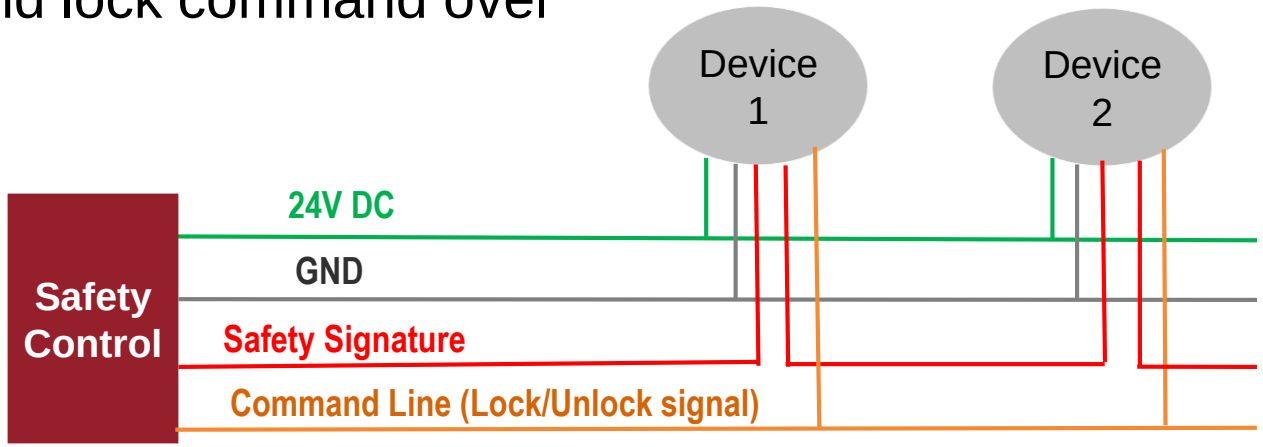
- Single type of wiring (3-wire)
- Single configuration platform (Studio 5000®)

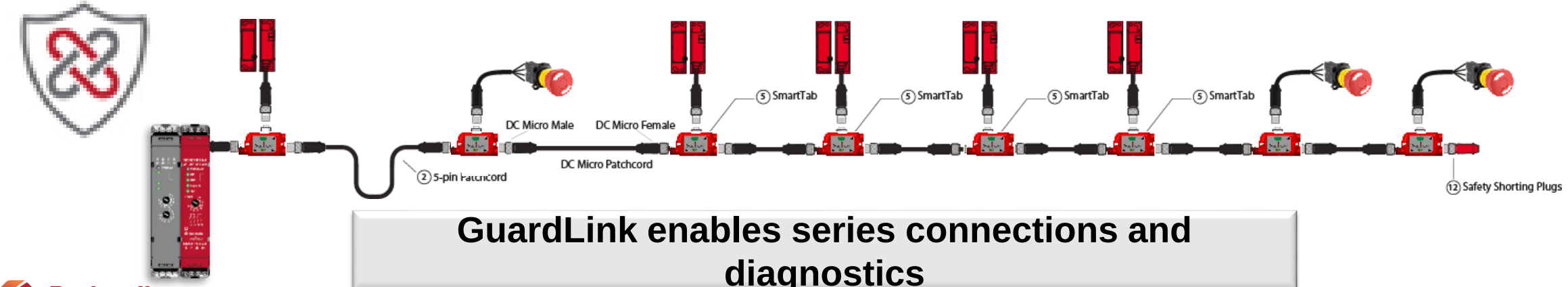
Smart Safety Devices



Smart Safety Architecture

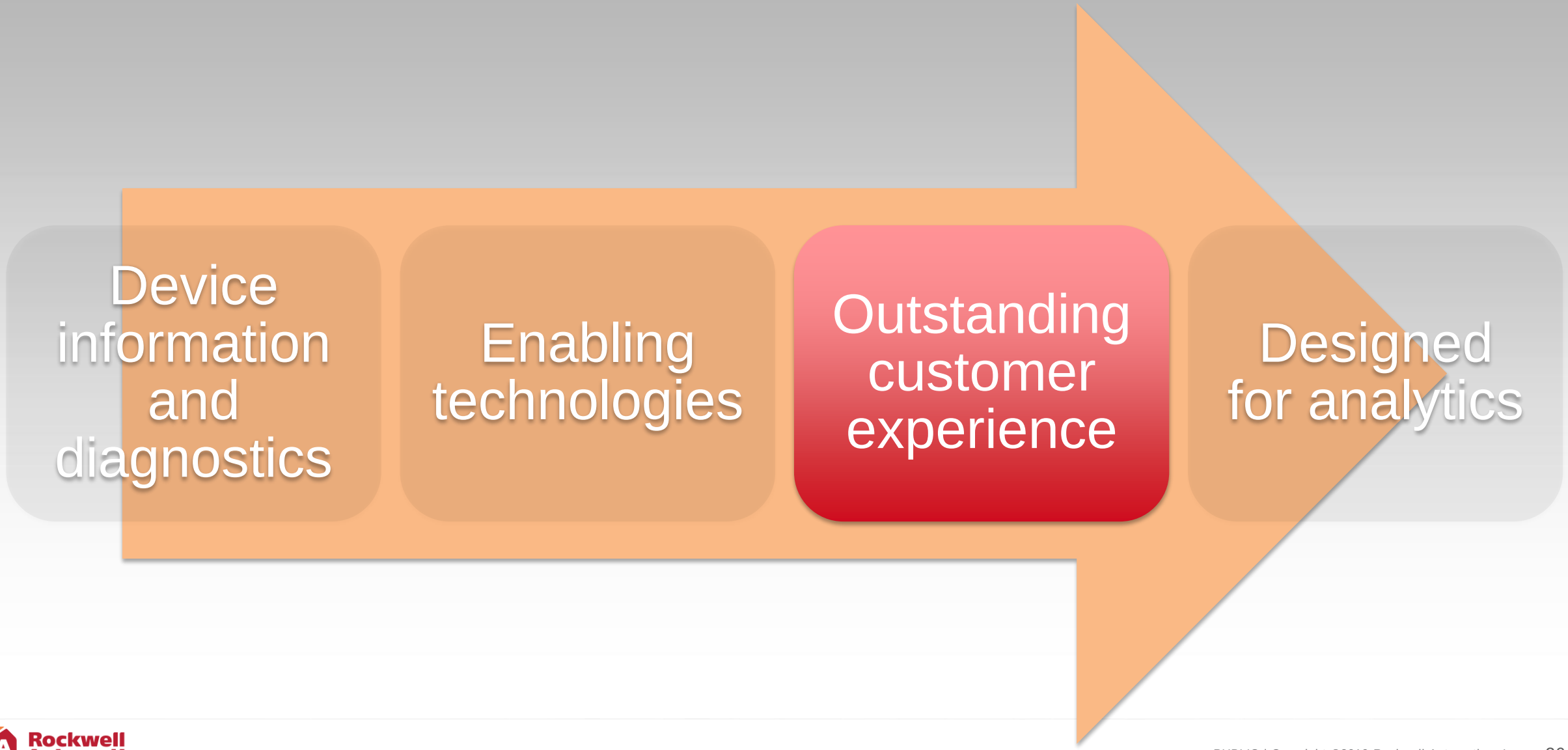
- Safety-rated series wiring with enhanced diagnostics
- Support safety, diagnostics, remote reset, and lock command over one cable
- System knows which device is tripped
  - Also differentiates tripped vs faulted
- TÜV certified PLe
- Trunk and drop topology
- Plug and play, no configuration required





GuardLink enables series connections and diagnostics

What makes Devices Smart?



Premier Integration

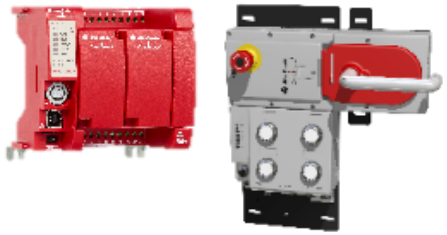
Delivers increased value when combining:

Studio 5000 Software

Logix Controllers

Smart Motor Control

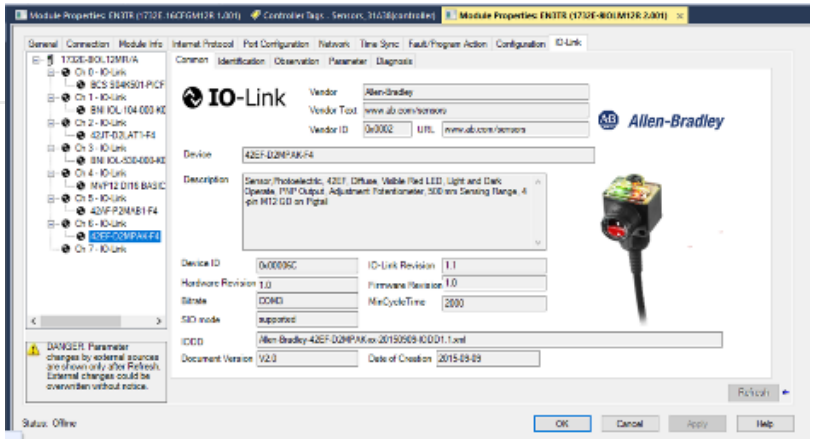
Smart Sensors



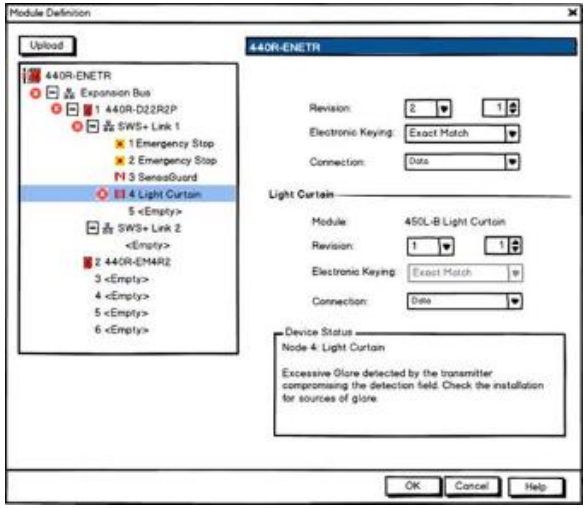
Smart Safety

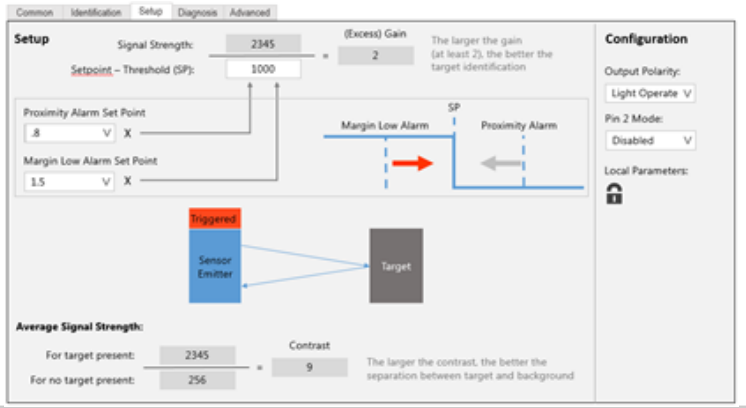
Add-On Profiles in Studio 5000 Environment

- Integrated Add-On Profile in Studio 5000 design environment
  - Device data tags in the Tag Database
  - Time Stamping
  - Device-specific screens / configuration



ModuleName_SWSLNK01	(...)	SWS_...	SWS Structure
ModuleName_SWSLNK01.LinkSafetyActive	0	BOOL	SWS Structure Indicates when the complete SWS+ link
ModuleName_SWSLNK01.SafetyDemandPresent	0	BOOL	SWS Structure Indicates that a safety device on the SV
ModuleName_SWSLNK01.DiagnosticPresent	0	BOOL	SWS Structure Indicates that one of the safety devices
ModuleName_SWSLNK01.FaultPresent	0	BOOL	SWS Structure Indicates that one of the safety devices
ModuleName_SWSLNK01.DiagnosticCode	0	SINT	SWS Structure Indicates the diagnostic status of the firs
ModuleName_SWSLNK01.FaultCode	0	SINT	SWS Structure Indicates the fault status of the first safe
ModuleName_SWSLNK01.DemandNode	0	DINT	SWS Structure Indicates the specific safety devices on
ModuleName_SWSLNK01.DiagnosticNode	0	DINT	SWS Structure Indicates the specific safety device on t
ModuleName_SWSLNK01.FaultNode	0	DINT	SWS Structure Indicates the specific safety device on t
ModuleName_SWSLNK01.NodesConfigured	0	DINT	SWS Structure Indicates the safety device nodes detec

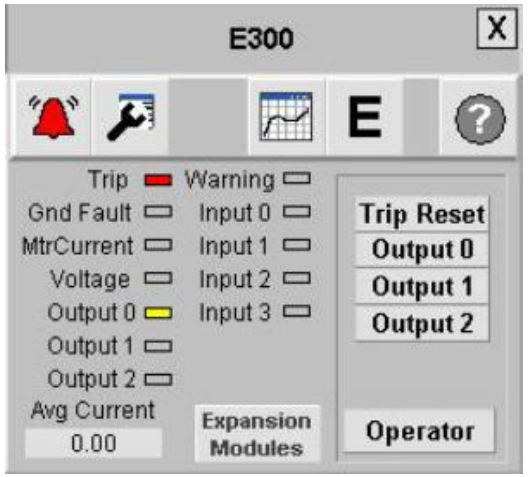




Smart Devices provide premier integration with Studio 5000 design environment

FactoryTalk View Faceplates

- FactoryTalk® View faceplates are available for the many devices
  - FactoryTalk View (ME or SE)
  - PlantPAx® process automation system
- Pre-written and tested human machine interface graphics
  - Import into FactoryTalk View Studio projects to minimize engineering time



Automatic Device Configuration

Field Device

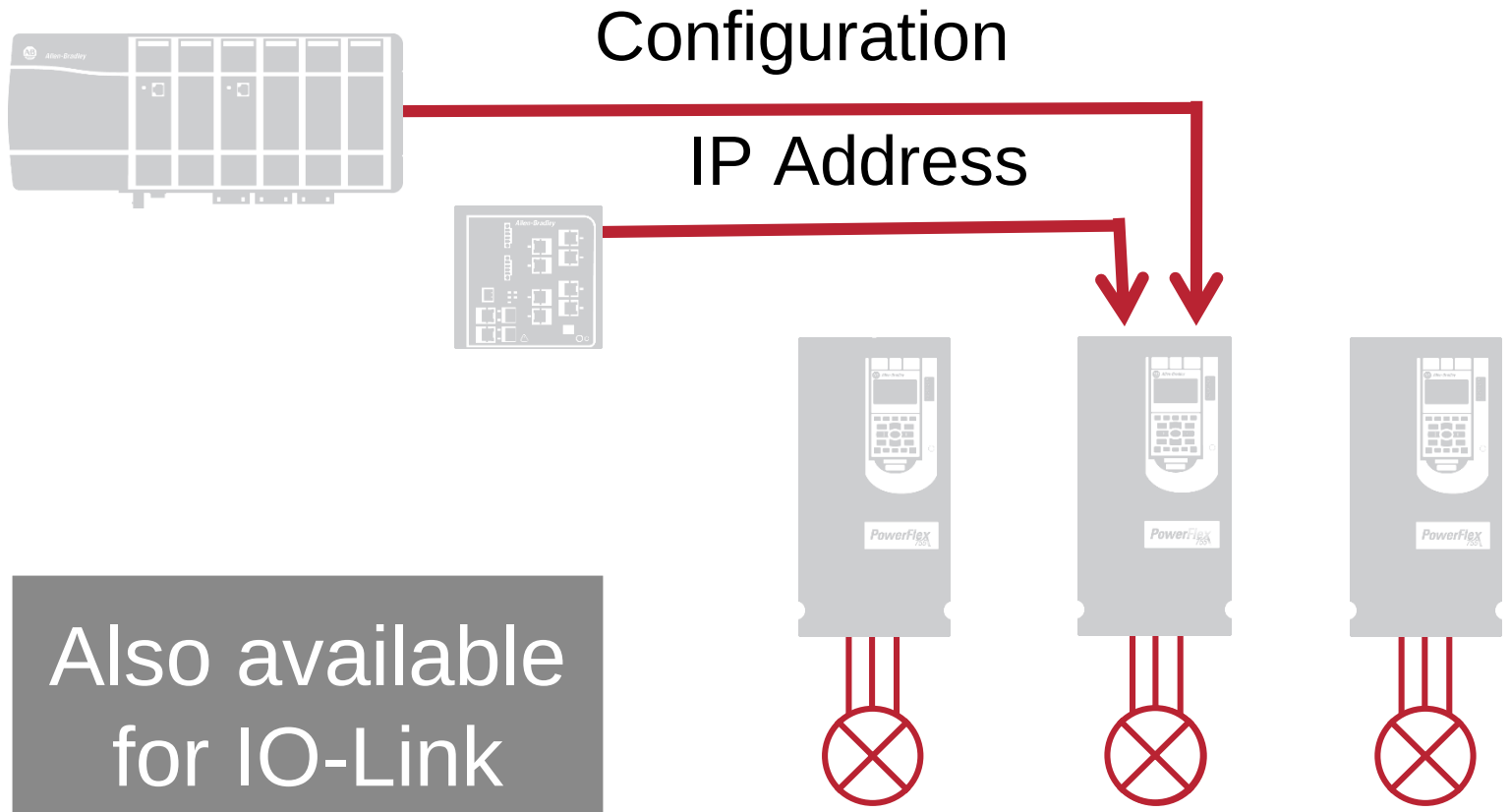
+

Controller

+

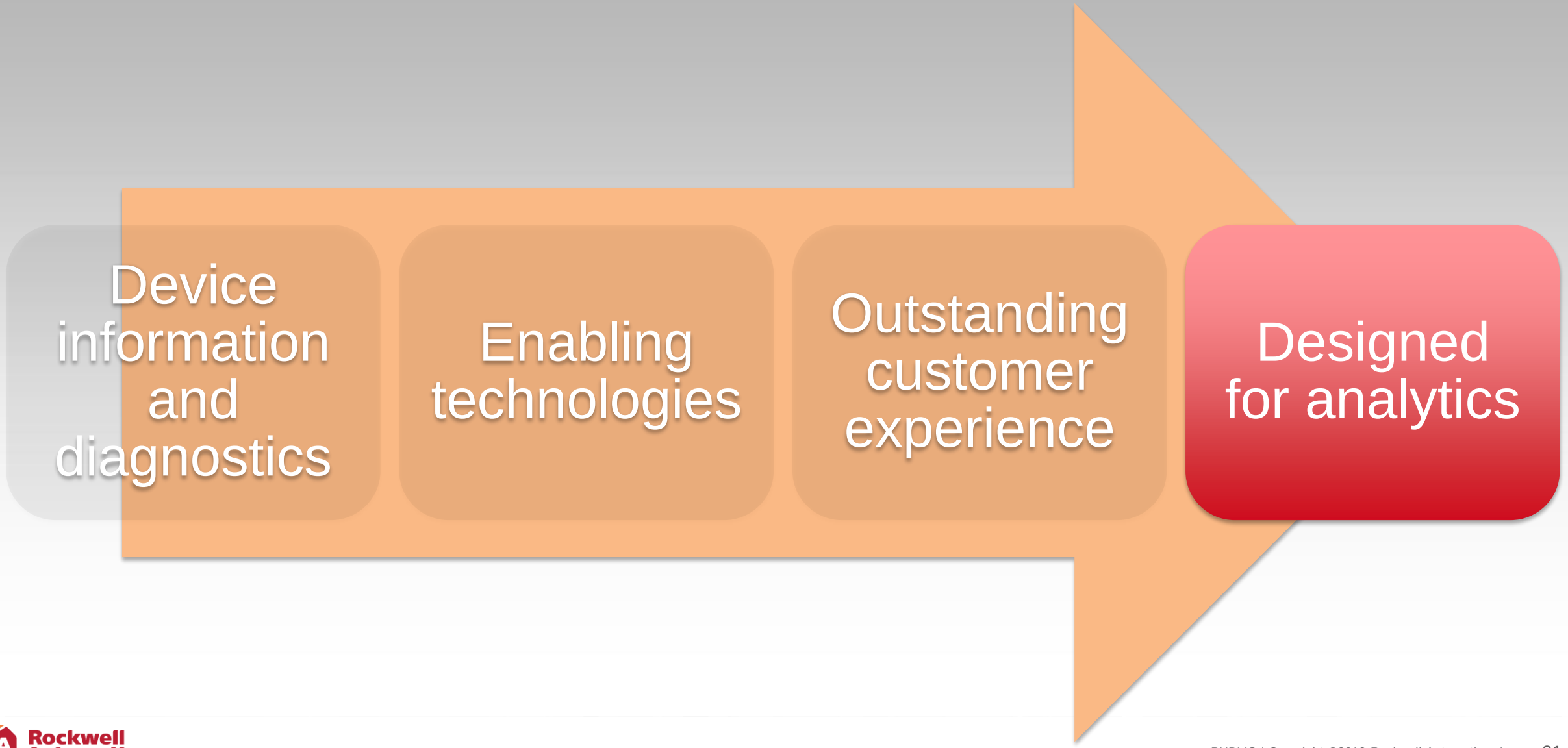
EtherNet/IP

LOWER TIME TO REPAIR



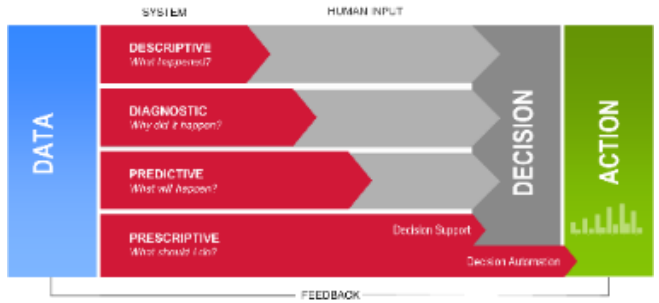
Also available for IO-Link devices!

What makes Devices Smart?



Device Analytics

- Smart devices provide the information needed to maximize the value of emerging solutions
  - FactoryTalk® Analytics for Devices
  - FactoryTalk Analytics for Machines
  - FactoryTalk TeamOne
  - Information solutions

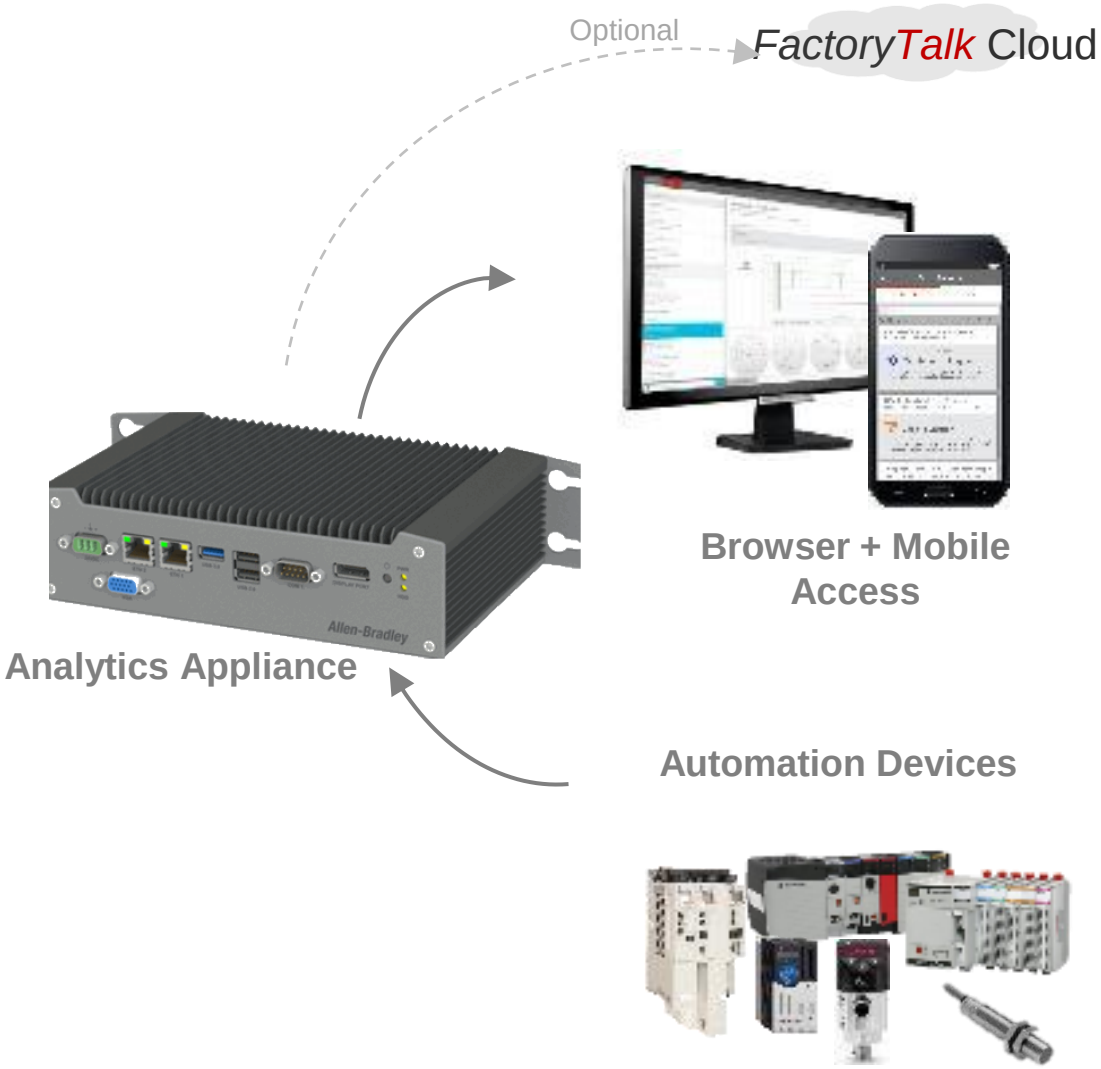


Smart Devices are part of the evolution of industrial analytics and mobile access to information from everywhere

FactoryTalk Analytics for Devices

What Does It Do?

- Monitors and improves MTTR (Mean Time to Repair)
- Performs analysis on device data
- Provides device issue notifications
- Provides simple and immediate instructions for corrective measures
- Learns what devices are most important/critical
- Performs system level health & diagnostics to solve hard-to-discover issues



FactoryTalk® Analytics for Devices

MONITOR & INTERACT WITH IIoT DEVICES, IMPROVE PLANT HEALTH

DETECT your smart devices, automatically

DIGITIZE the data, allowing work to be done

ANALYZE the data perform calculations, transform the data

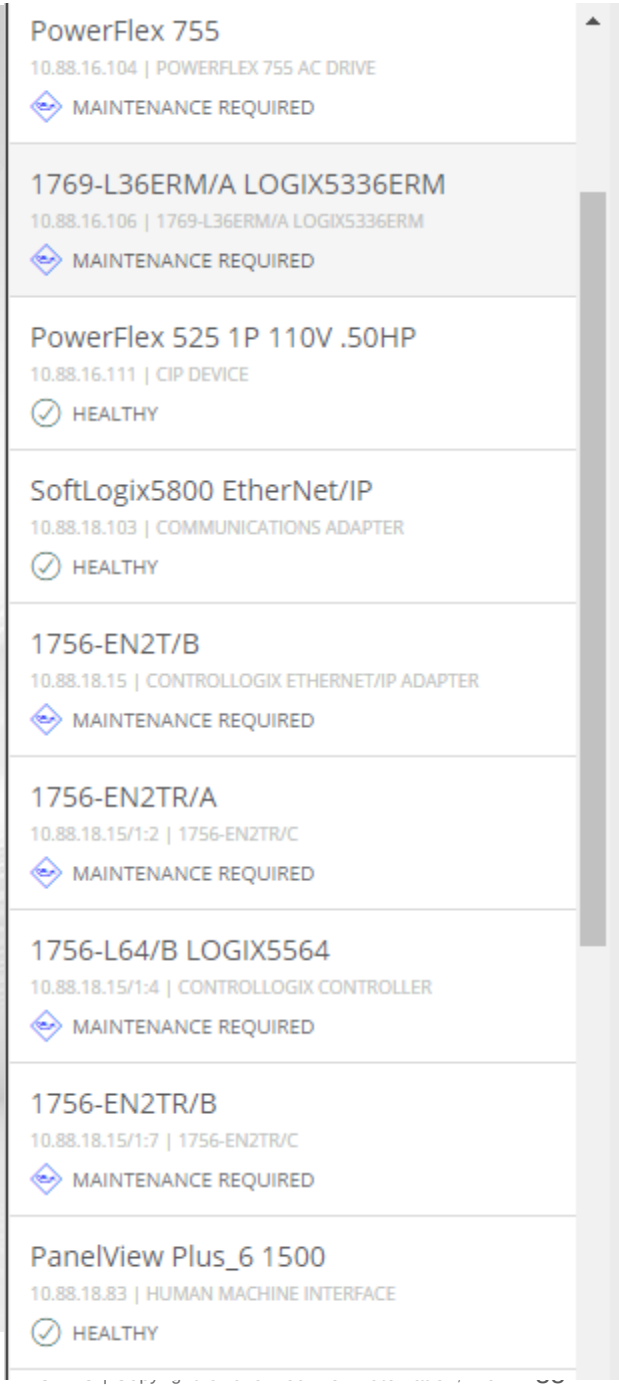
ACT on information, get to the right people, on the right device

Immediate value delivered as an Industrial Appliance; Self-contained and FactoryTalk Cloud aggregation options

DETECTS

On boot up, the appliance detects devices on the local the local network

- Locates any Ethernet/IP (CIP) devices automatically
- Customizable
  - You can specify ranges or specific IP addresses to include/exclude
- Communicates directly to devices, not thru controller
  - Low network impact, intelligent throttling
- Future: Add different protocols

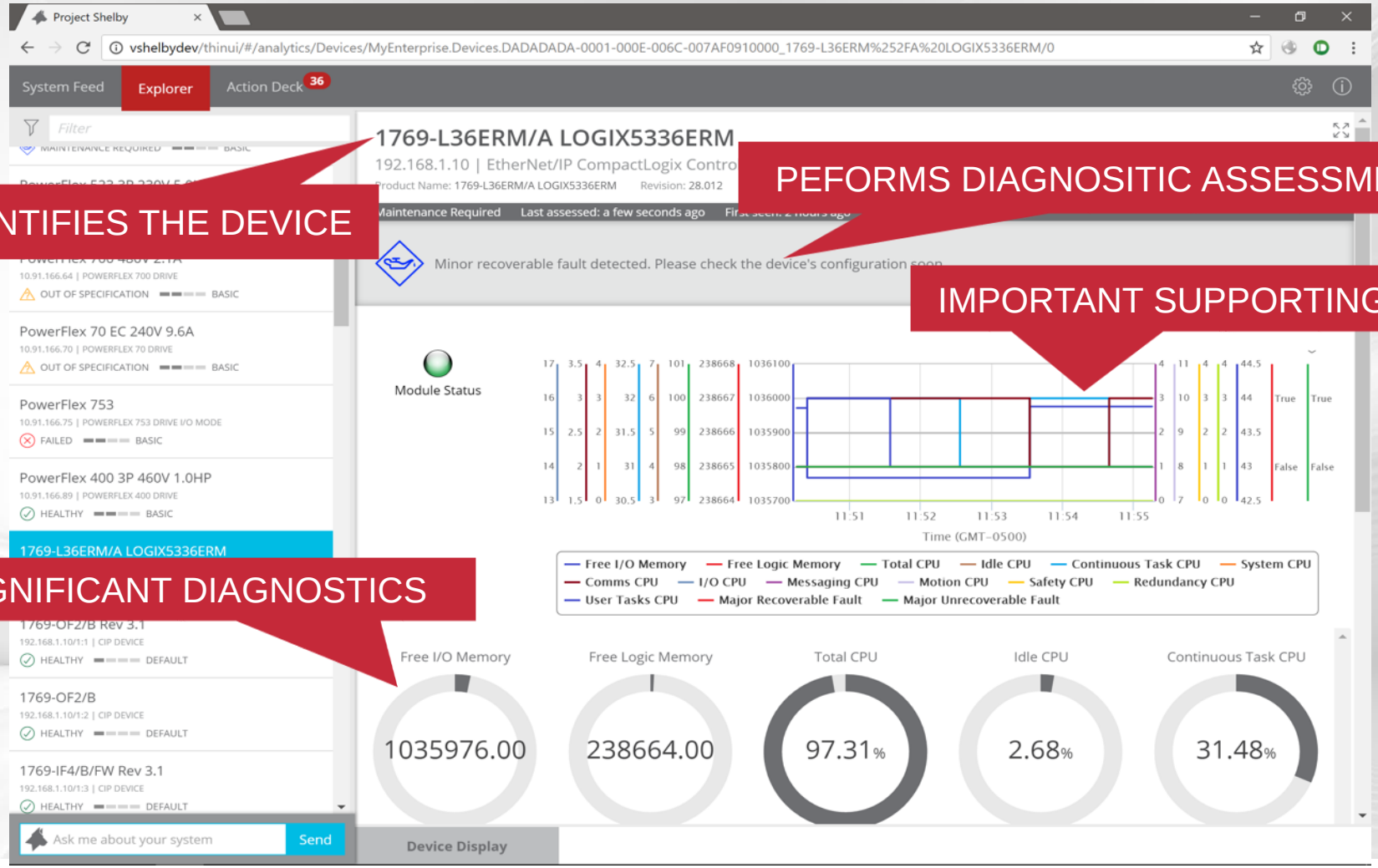


FactoryTalk® Analytics for Devices

Rockwell Automation

ALL DONE AUTOMATICALLY!

DASHBOARDS



IDENTIFIES THE DEVICE

PEFORMS DIAGNOSITIC ASSESSMENT

IMPORTANT SUPPORTING DATA

SIGNIFICANT DIAGNOSTICS

FactoryTalk® Analytics for Devices

Rockwell Automation

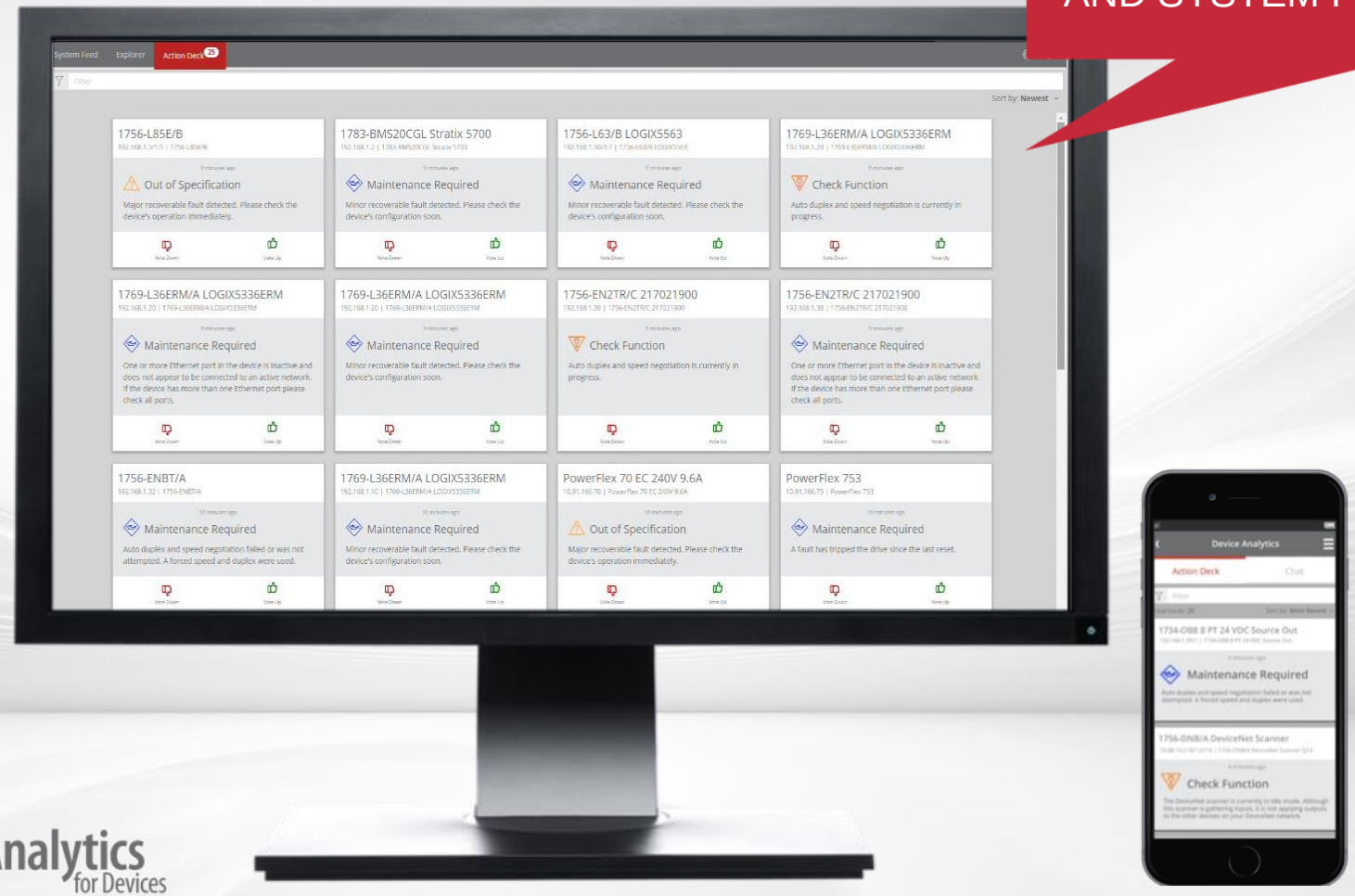
WHAT DEVICES ARE
SUPPORTED

- Any Ethernet/IP device responds with a default diagnostic status
- Over 2,000 devices have specific diagnostics built-in
- Capable of complex analysis based on the data from the devices
- Example: PowerFlex® 755 has over 80 points of data and then an extra 30 created by our analyzers
- Our most popular families will have coverage (Logix, PowerFlex, Kinetix)
- This is an area for future expansion, both in devices supported, 3rd party devices supported and customizability
- Diagnostics on **100 devices** per Shelby

FactoryTalk® Analytics for Devices

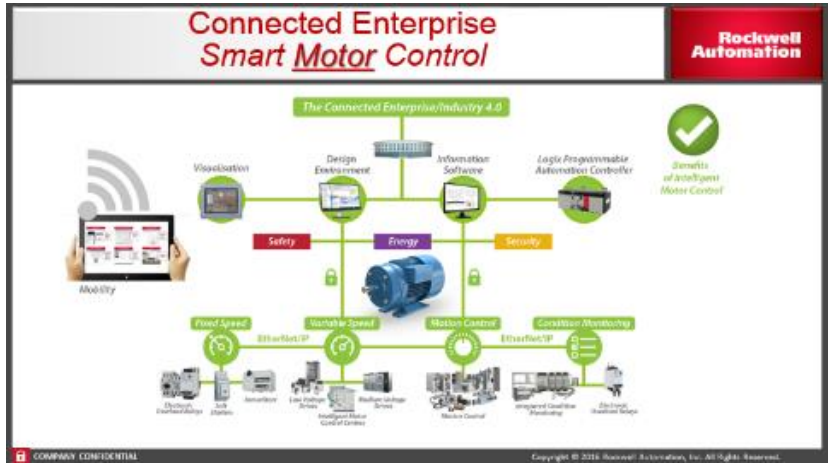
ACTION CARDS

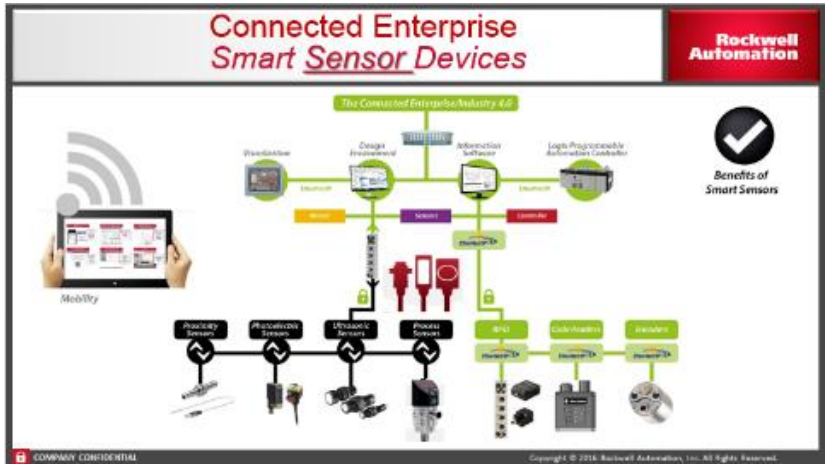
DELIVERED WHEN SOMETHING OCCURS AND SYSTEM FEELS ACTION IS REQUIRED

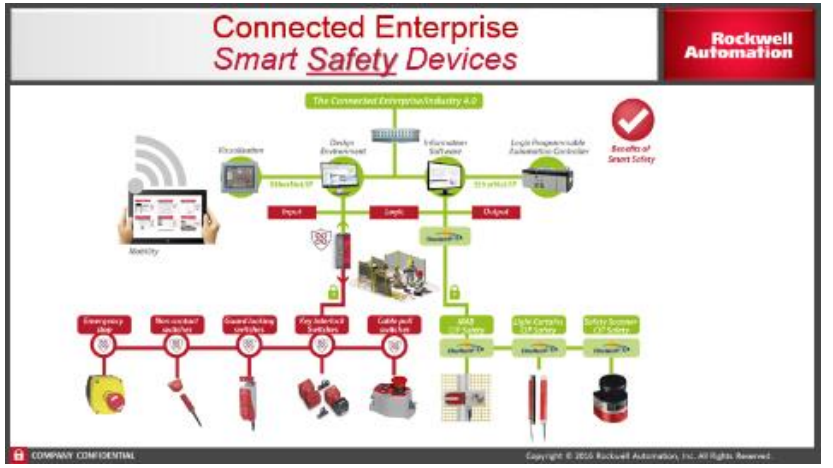


FactoryTalk® Analytics for Devices

Smart Devices







For more information visit:

rok.auto/smartdevices

Rockwell Automation

Innovation & Technology Forum

Thank you

Contact me via LinkedIn! – **Peter Madarasz**