IEEE IAS Atlanta Chapter Meeting

11/21/22

IEEE
Advancing Technology for Humanity

Agenda

- Members Open Forum
- Main Presentation
- Q&A
- Next Meeting Announcement

Members Open Forum

In an Orderly Fashion, Please Unmute Yourself or Request the Microphone

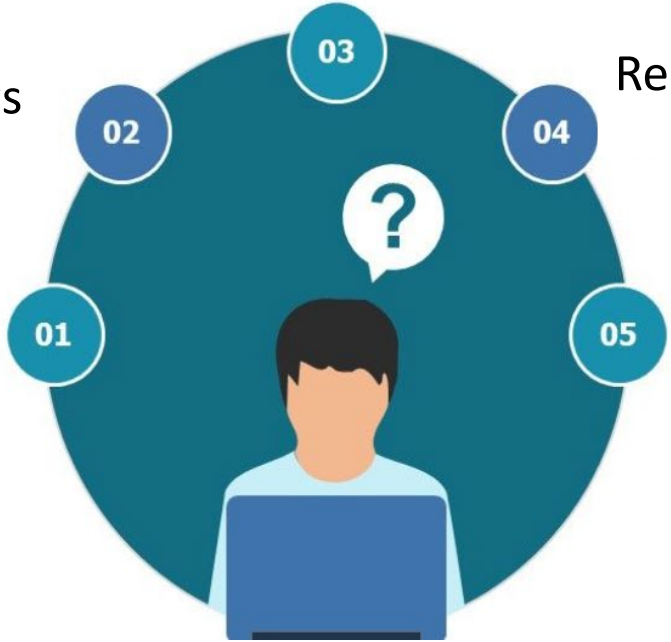
Outreach Opportunities

Job Openings

Recommended Topics

Related Announcements

Asks



Industrial Automation Trends & Emerging Technologies

Presenter: Mike Crevar - Automation Sales Executive – Schneider Electric

- BS Electronics Engineering Technology, Southern Tech
- MBA, Kennesaw State University
- Based in Atlanta, GA
- 21 years' experience in Industrial and Building Automation and Controls industry
- 37 years' experience Army and Air Force
- Held roles as Army Logistics & MRO Officer, Lieutenant Colonel, Business Development Manager – GE Intelligent Platforms, Application Engineer – Siemens

mike.crevar@se.com

Topics

Industrial Automation Trends & Emerging Technologies

- Similarities and differences between a Distributed Control System (DCS) and a Programmable Logic Controller (PLC) system.
- Merging of Information Technology (IT) and Operational Technology (OT).
- Functionality of different types of Industrial Automation (IA) software – like SCADA, Asset Operation Software, Asset Performance Management (APM), Enterprise, Edge, and Field Operational Software.
- Industrial Automation industry is transforming and adapting their products to meet the **IEC 61499** international standard.

Topics

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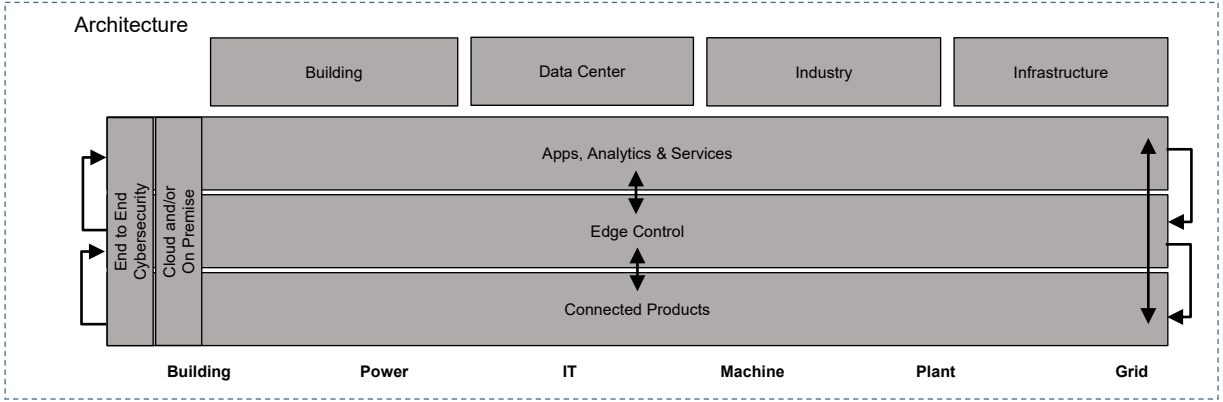

** Reference: Schneider Electric EcoStruxure Industrial Business*

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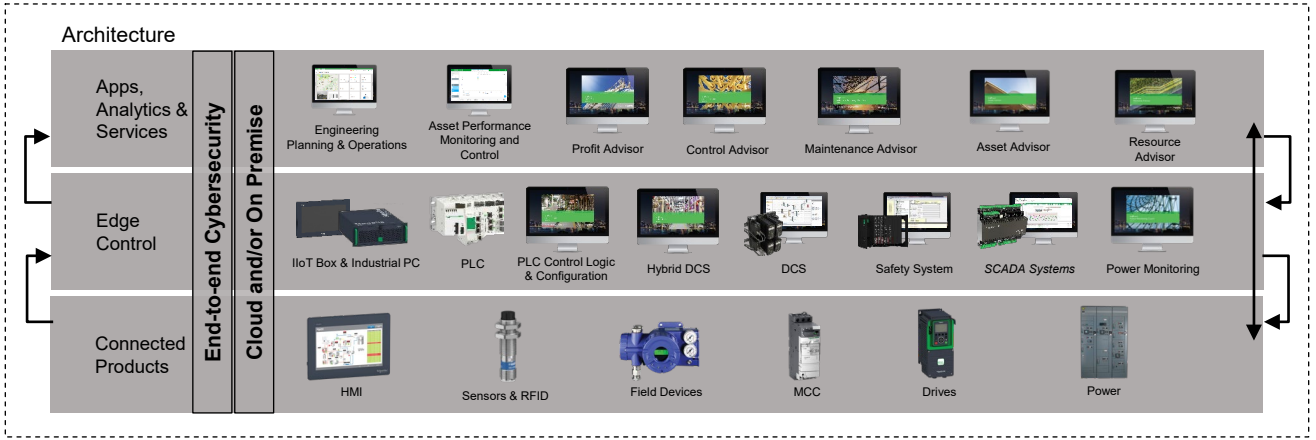


** Reference: Schneider Electric EcoStruxure Industrial Business*

Distributed Control System (DCS)
Programmable Logic Controller (PLC)
Systems

DCS/PLC

Past & Present

Traditional control systems: These control systems used banks of relays and contactors with no operator interface other than start or stop buttons to initiate actions and lamps to follow the progress of an operation and notify the operator upon completion.

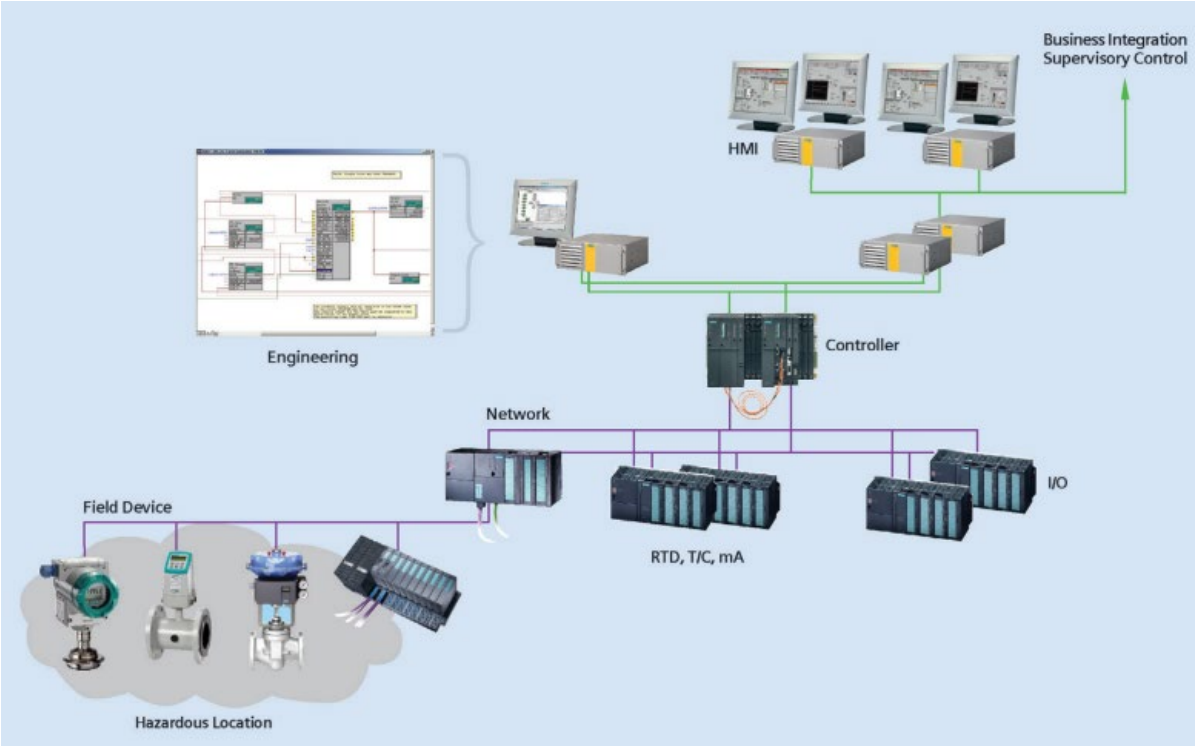
Early process controllers, such as PID controllers, were physically one with the operator faceplate. They included not just a process variable (PV) indicator on a calibrated scale but also a setpoint (SP) indicator on that scale and a control signal output indicator.

DCS: These control systems are hardware and software systems that distribute important control functions, for example, controllers, historians, and display units or human-machine interfaces (HMIs), into different boxes. Today, most process industries, such as oil refineries, chemical plants, and paper-making plants, use DCS.

Reference: https://schneiderelectric.sharepoint.com/sites/ProductCampus/SitePages/EcoStruxure-Foxboro-DCS.aspx

Distributed Control System (DCS)

General Architecture

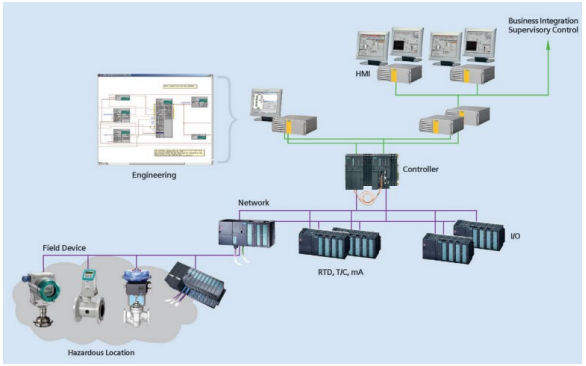


Reference: https://assets.new.siemens.com/siemens/assets/api/uuid:55f0c13a-8da4-4540-ba11-27ed29de2396/pawp-00015-0619-dcs-or-plc-whitepaper-sii.pdf

Distributed Control System (DCS)

Characteristics of DCS

- Continuous and Batch Processing
- Popular Industries: Oil & Gas, Chemical, Pharmaceutical, Pulp & Paper
- Redundant and Triple Redundance, Burner Management Systems
- Packaged System “Control System in a Box”
- Uses “closed-loop” algorithms, great accuracy to achieve setpoint
- Higher cost $$$ to implement
- Regulation and Certification standardized reporting templates
- Centralized and Function Block programming, segment libraries
- MES, Historian, real-time condition monitoring and predictive maintenance, machine optimization, etc.
- 24/7 operation, planned plant outages
- High-speed processing or lines, not typical
- Built in safety, reliability, efficiency, sustainability and connectivity



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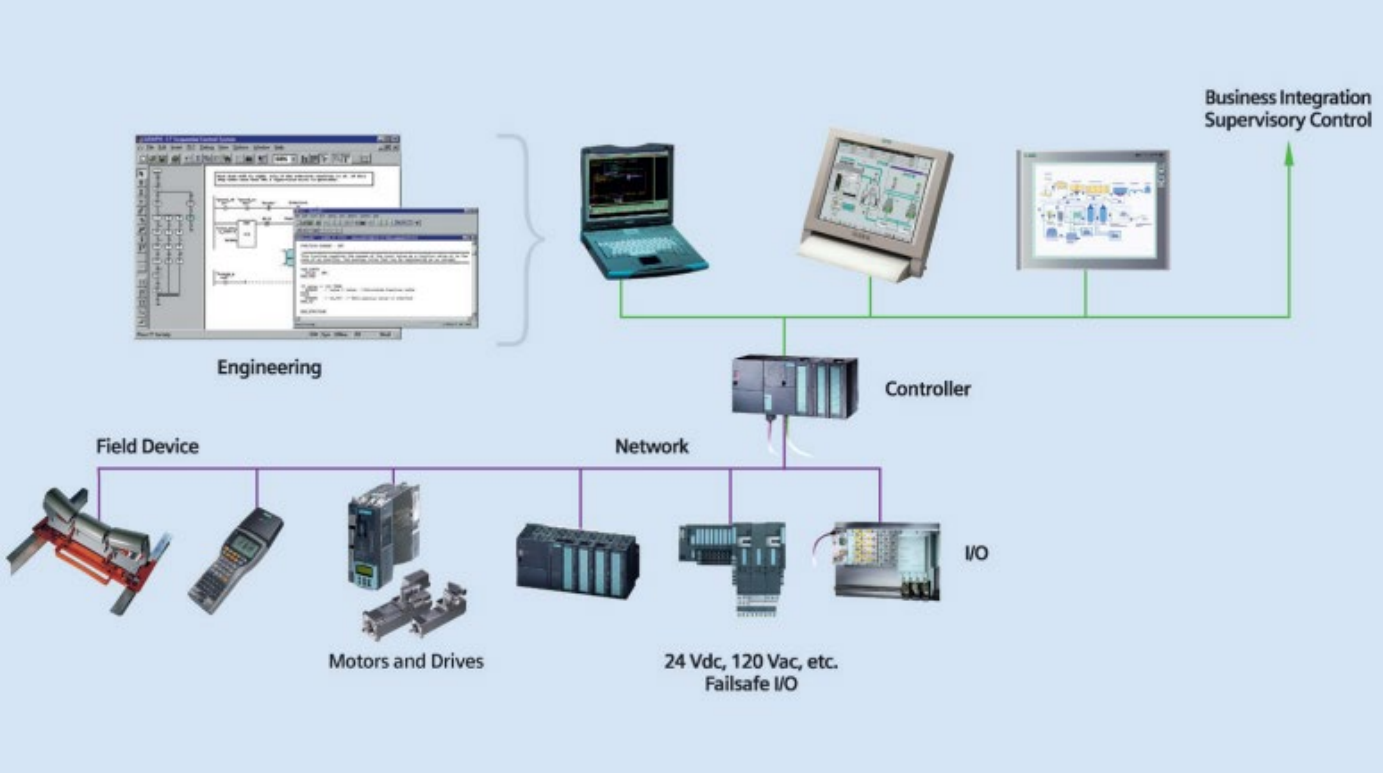
Programmable Logic Controller (PLC)

General Architecture



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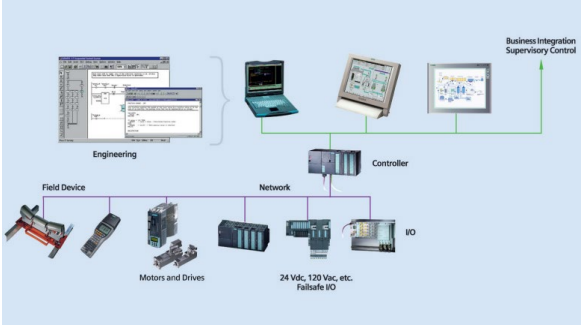
Programmable Logic Controller (PLC)

Characteristics of PLC

- Discrete processing, relay logic
- Popular Industries: CPG, WWW, Manufacturing, Automotive, Transportation, MMM
- Redundance, Hot-Standby
- Open communication protocols and system architectures
- Multiple programming languages, **IEC 61131-3**
- Lower cost $$ to implement
- Supports third-party integration
- Ideal for plants with frequent shutdowns
- Enterprise level: SCADA, Asset Management, etc.
- High-speed processing and lines, robotics, OEM machines
- Safety, reliability, efficiency, sustainability and connectivity



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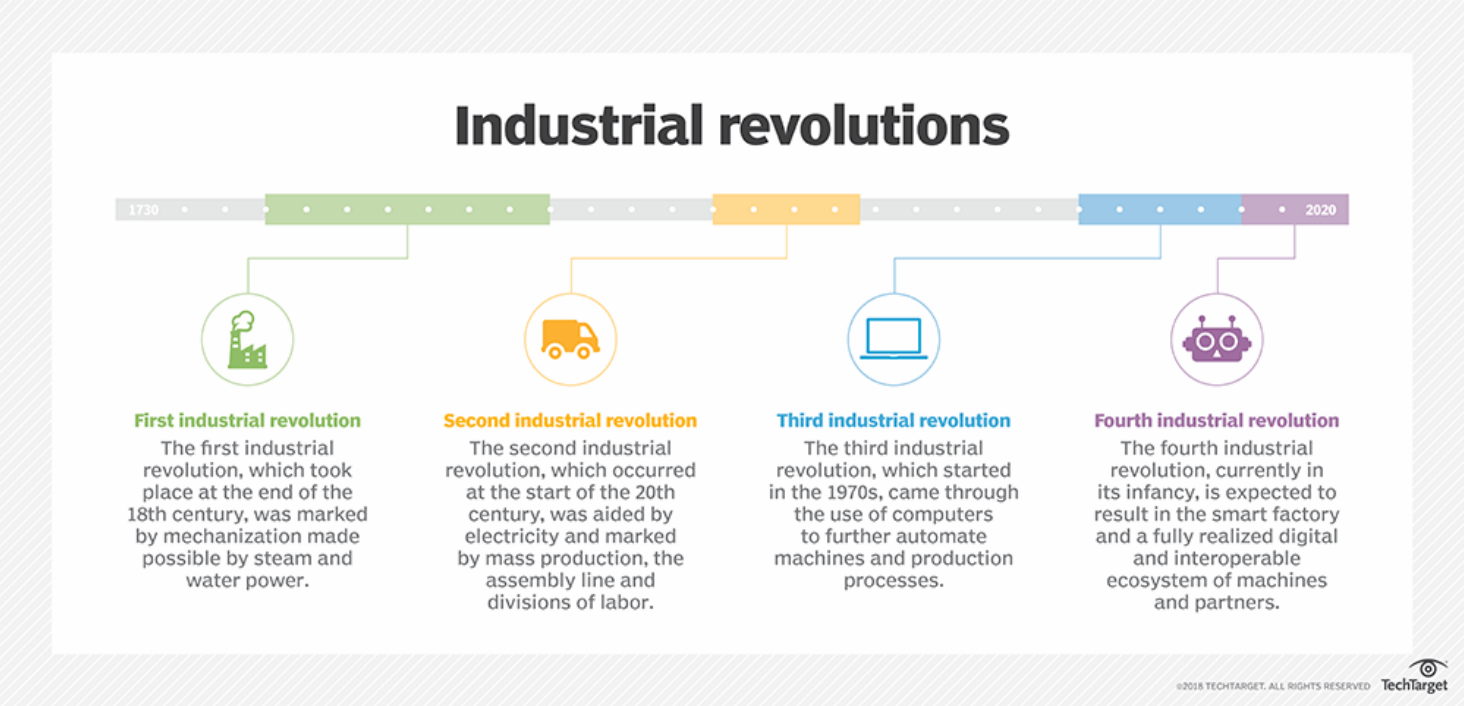
IT/OT Convergence

IT/OT

Industry 4.0

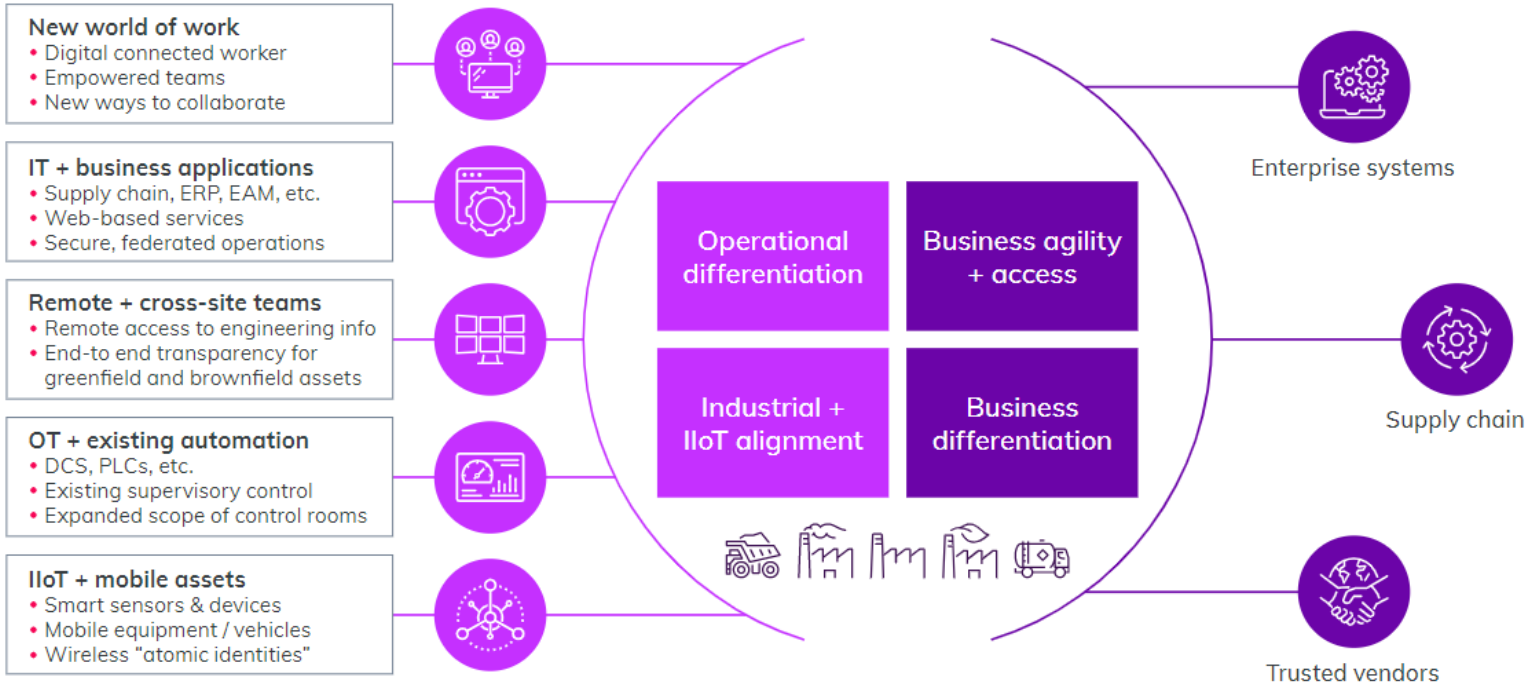


Reference: https://www.techtarget.com/searchitoperations/definition/IT-OT-convergence

IT/OT

Industry 4.0

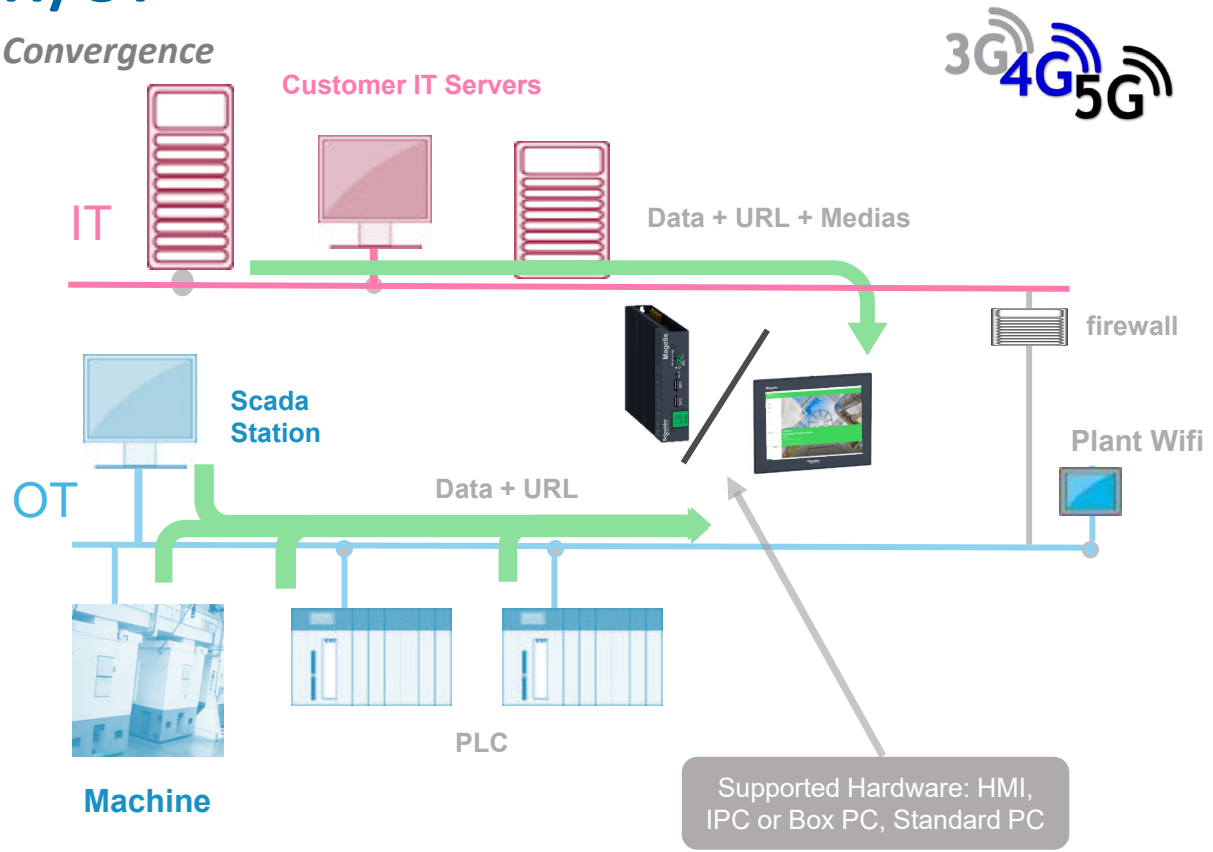
The reality of convergence. One connected landscape.



Reference: https://discover.aveva.com/paid-search-industrial-cloud-hybrid-saas?utm_term=industrial%20software&utm_campaign

IT/OT

Convergence



OR

Mobile device

App

Assets,
Machines, Plant

Augmented
Operator Advisor
Builder

Reference: https://schneiderelectric.sharepoint.com/sites/ProductCampus/_layouts/15/search.aspx/siteall?q=IT%2FOT

IT/OT

Operator Features & Business Model

SECURE REMOTE ACCESS SOLUTION

- Firmware and Applications upload / download (HMI, PLC, Drives, …)
- Remote programming and diagnostics
- Remote control and monitoring
- Connectivity: Ethernet /Wi-Fi
- 3G/4G/5G connection through additional USB devices
- Cyber secured (end to end)
- Software machine connection OS independent

REMOTE ACCESS THROUGH NEW BUSINESS MODEL

- Access on demand
- Subscription benefits are discontinued on the day the Subscription expires if not renewed at the anniversary date.
- Pay per usage
- Easy online ordering
- Free Trial period (30 days)
- Simple offer and recurrent services (Annual fee)
- Software Machine connection – Ready to use
- Full software solution downloadable from the web

Reference: https://schneiderelectric.sharepoint.com/sites/ProductCampus/SitePages/Transversal-Advisors.aspx#pro-face-connect

Industrial Automation (IA) software

IA Software

Customer Needs

Customers struggle with complexity…

- Continued pressure to reduce costs
- Increased product variants and shorter product lifecycles
- Fluctuated demand in energy, and raw material prices
- Increased regulation
- Continued workforce evolution

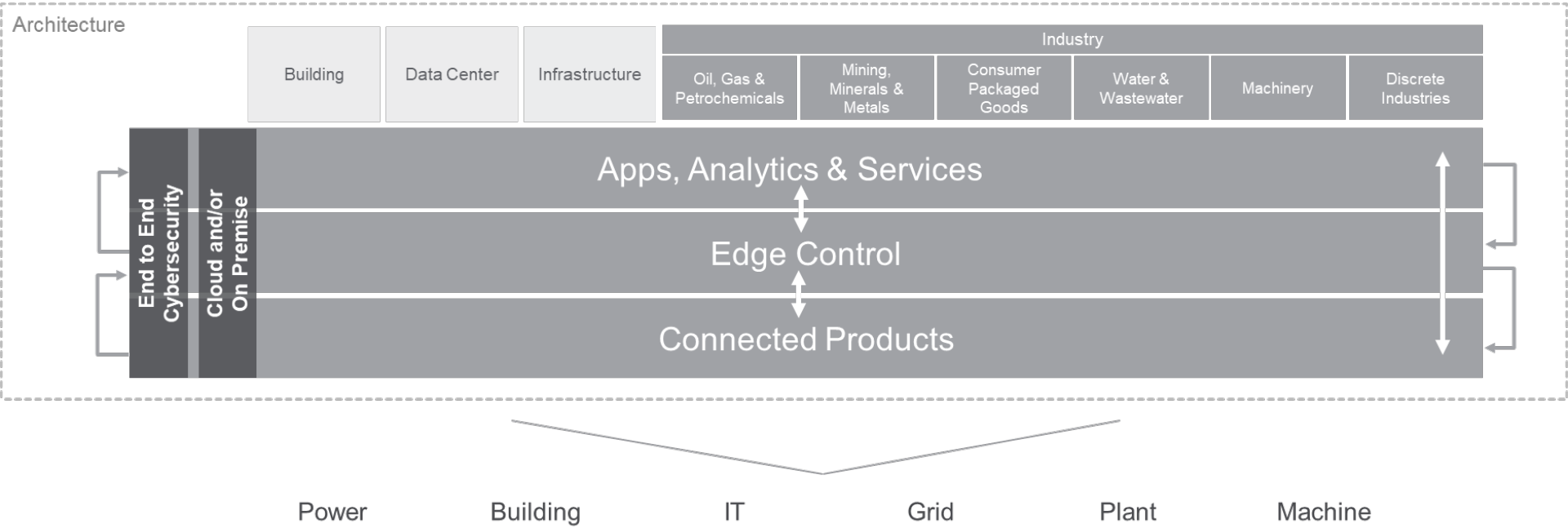
…and look to technology to help

- Machine learning / Data science
- Augmented / Virtual reality
- Digital twins
- Edge computing
- Cloud architectures
- Wireless sensors
- Open systems

Reference: https://schneiderelectric.sharepoint.com/:p:/r/sites/ProductCampus/_layouts/15/Doc.aspx?sourcedoc

IA Software

Architecture



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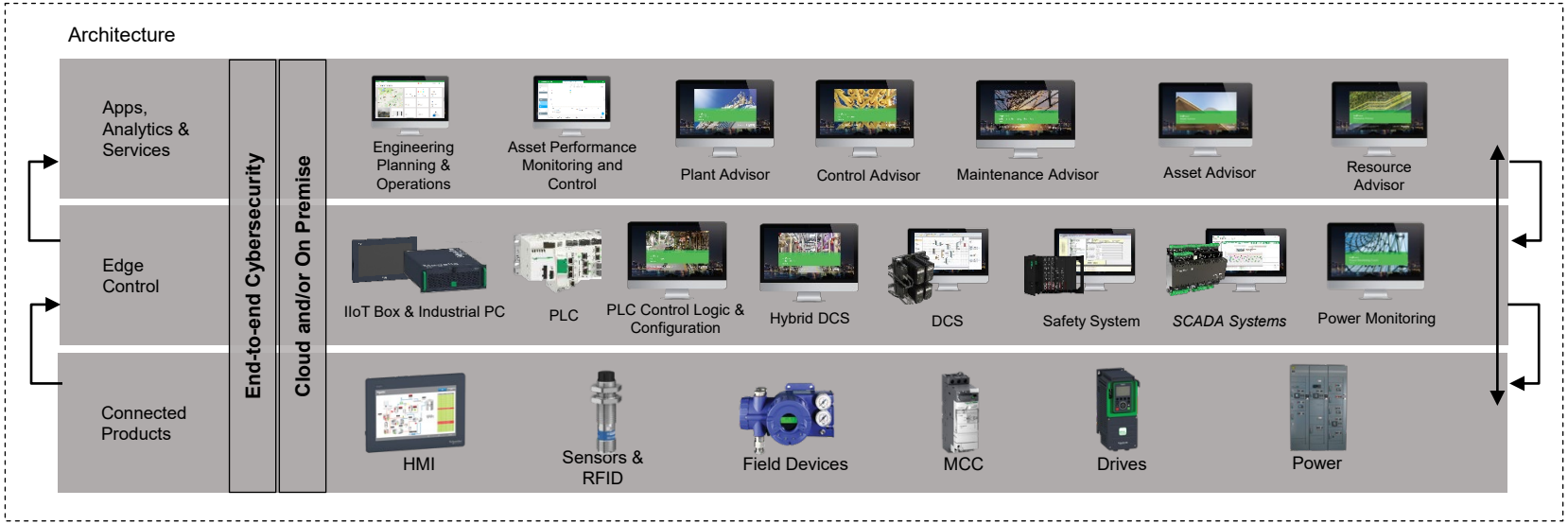
IA Software

Architecture



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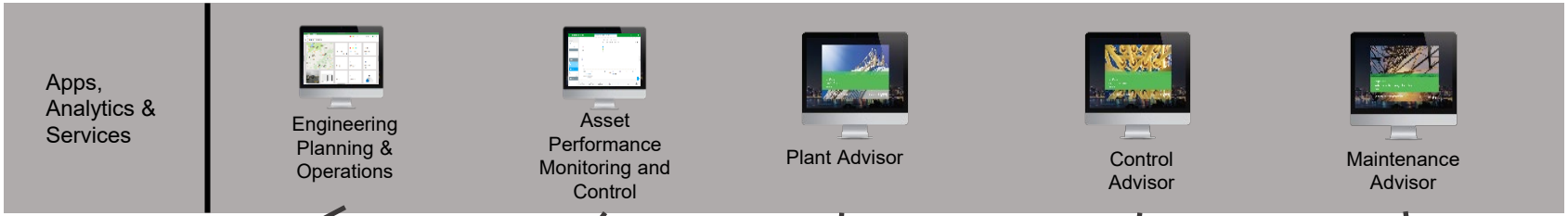
IA Software

Apps, Analytics & Services



Set of agnostic software engineering tools that support you by automating tasks such as code verification, conversion, reverse-engineering, and troubleshooting

Monitor critical rotating equipment Tools based on vibration sensors, measures electrical waveforms, creating scalable solution.

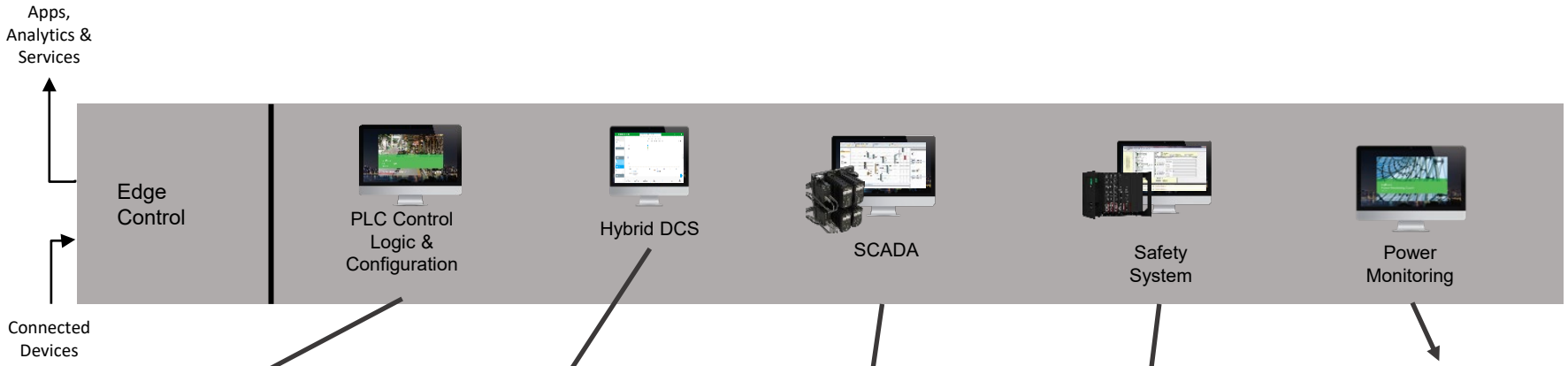
Scalable IIoT platform. Common environment and centralized data service management to access multiple Industrial IoT Applications.

Performance solution to monitor, improve, and maintain your control loops.

Monitor the condition of field instruments, process control equipment, electrical switchgears, MCC units in real-time providing early insight into abnormal conditions and allow action to be taken.

IA Software

Edge Control



IEC 61131-3 programming, database configuration, trouble-shoot tools. PLC, IO and RIO rack layout. Connection to PLC, IO, and third-party devices.

Convergence of DCS and PLC technologies. Combination of PLC hardware with DCS software.

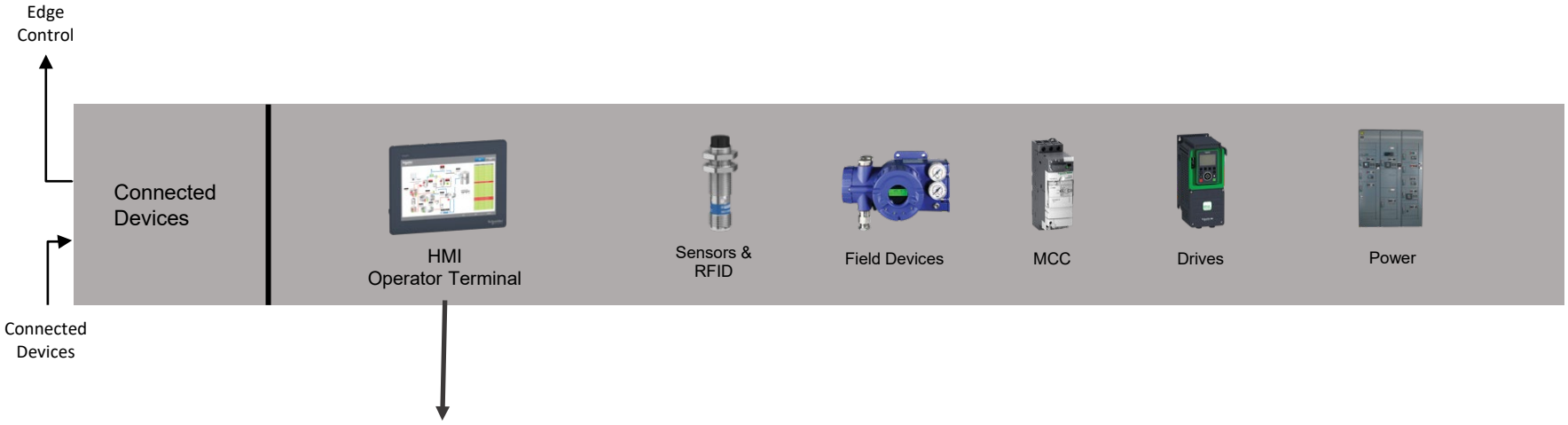
Supervisory Control and Data Acquisition Software.

Emergency shutdown systems. Fire and gas detection. Burner management system. Pressure protection system. Turbo machinery system.

Monitor and improve energy efficiency with consumption. Information directly from drives, motor, etc. Energy reporting and audits; ISO50002. Energy cost, energy period over period, energy usage by shift, event histories.

IA Software

Edge Control



- Human-Machine Interface.
- Smartphone-style of operation and navigation are becoming the standard.
- Screen area has increased.
- User interface must be easily adaptable to applications; auto-screen resolution.
- Adaptable operating system.
- Remote connectivity, and cloud services.
- Modern devices are expected to manage information exchange between IT and machine level.

International Standard

IEC 61499

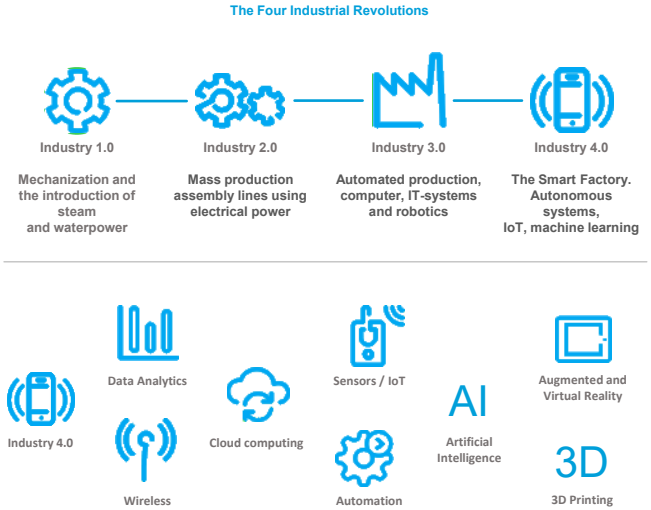
International Standard – IEC 61499

The next quantum-leap in industrial automation

The future is not business as a usual

2020: Software-centric automation

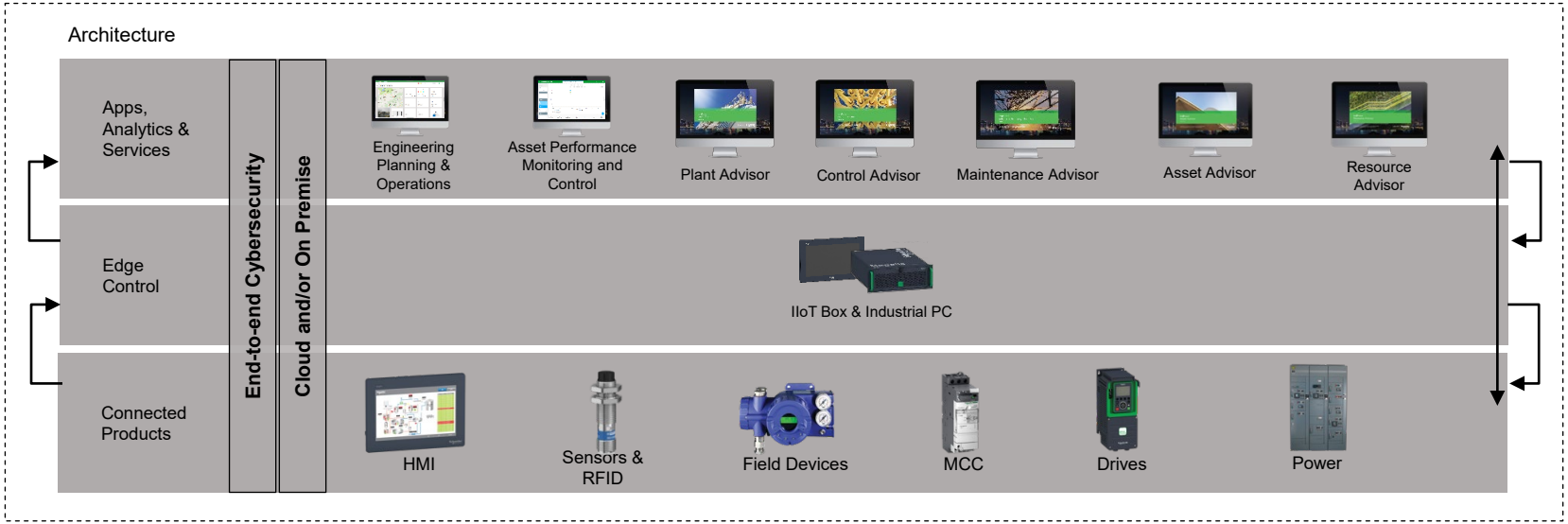
- After 50 years, it is not hardware but software that is driving automation to the next level
- Software-driven digital transformation is fueled by increased computational power and connectivity
- Addressing customers imperatives requires unprecedented flexibility, interoperability, and efficiency from industrial operations
- The **IEC 61499** standard with its event-driven, object-oriented, distributed approach is extending/enhancing the IEC 61131 standard, allowing automation systems to take advantage of IT technologies



Automation is key - where the physical meets the digital to close the loop from "***insight to action.***"

International Standard – IEC 61499

Software Centric Design



* *Reference: Schneider Electric EcoStruxure Industrial Business*

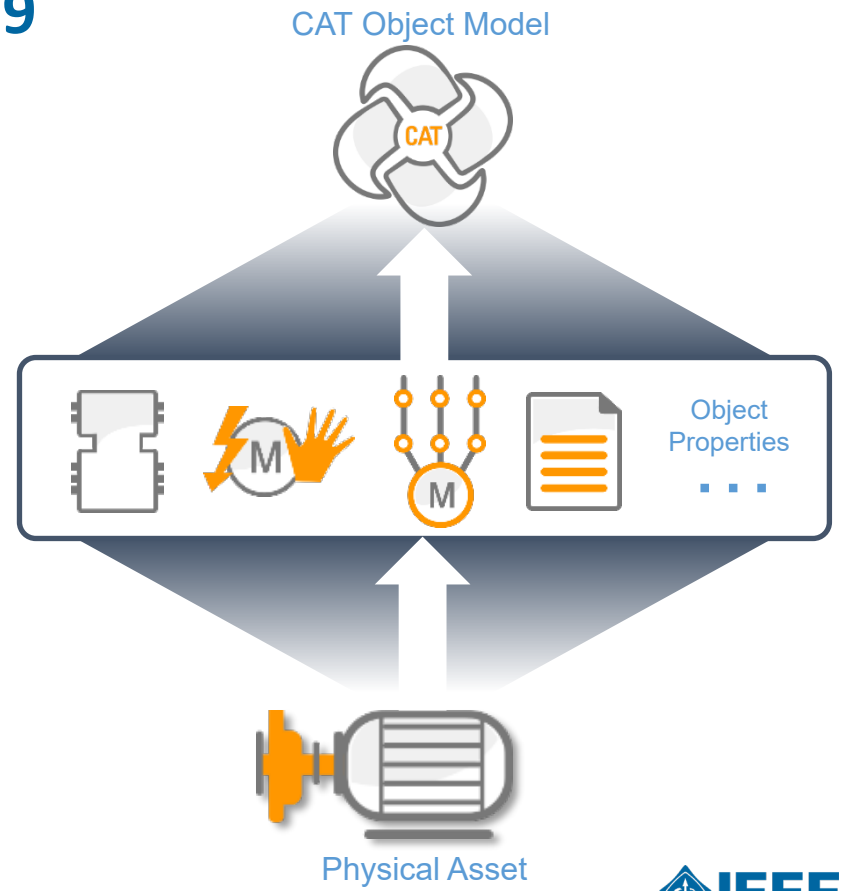
International Standard – IEC 61499

Composite Automation Type

Next Generation Engineering Platform

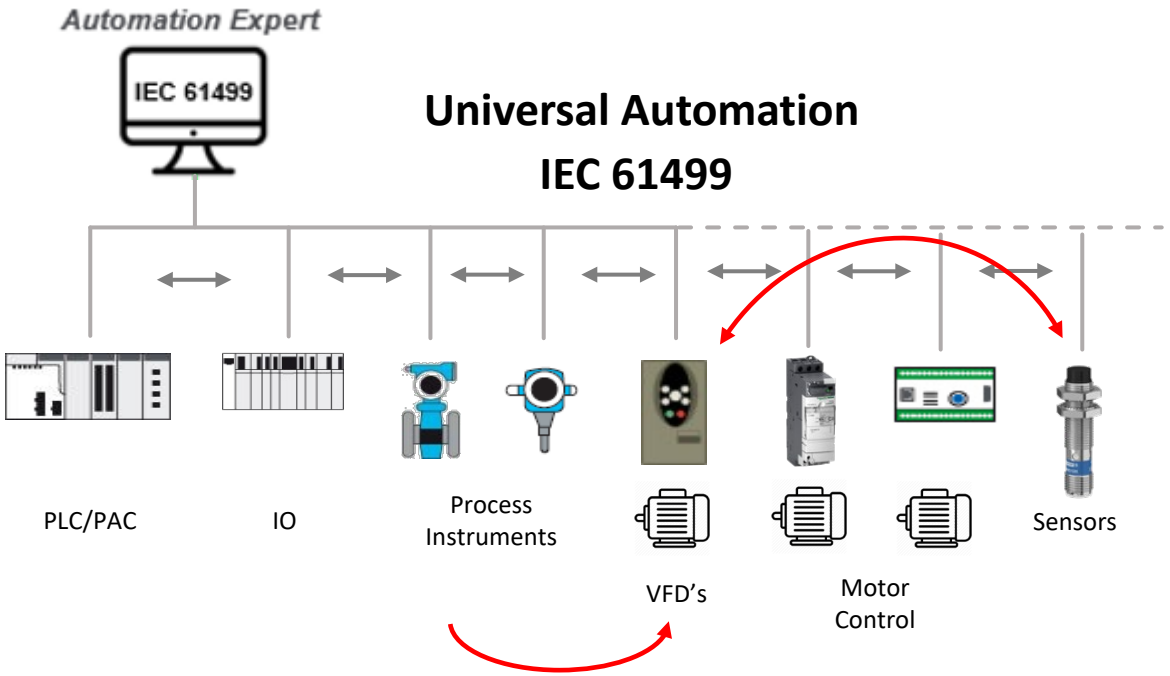
Single tool to configure, program and deploy applications to multiple control and HMI devices.

Control, HMI, documentation etc. encapsulated into asset models to manage complexity and support reusability & fast refactoring



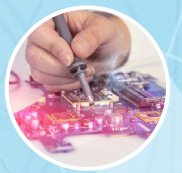
International Standard – IEC 61499

Software Centric Design



- Entire System / Plant visible from a single software application
- Separate Hardware from Software
- Any Smart device can potentially run code
- Each device has the same "Runtime"
- Truly distributed control but managed as ONE system.
- Customer can use Best in Class Hardware

Open Discussion and Q&A



Next Meeting: Monday 12/19/22

Topic: NEC 2023 – Analysis of Changes

Presenter: Jim Scerenscko