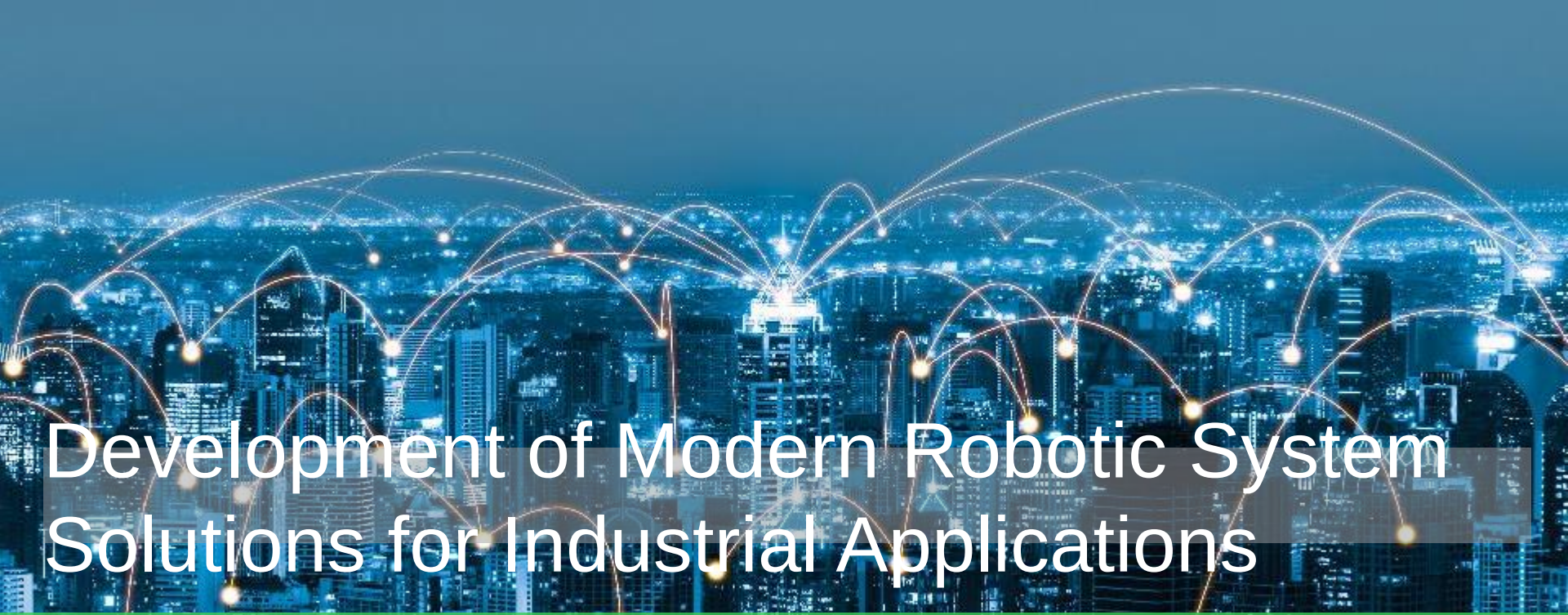


Development of Modern Robotic System Solutions for Industrial Applications

Dr. Nidal Ghizawi, Senior R&D Director
Saudi Schneider Electric Innovation & Research Center, Dhahran Techno Valley
Dec. 17th, 2021

Agenda

- Schneider Electric Innovation Platform
- **Physical** Robotic System Solutions
  - Development & Delivery Approach
  - Recent Use Cases
  - Recent Proof-of-Concept Customer Implementation
- Recent **Virtual** Robotic System Solution Examples
- Conclusions

Schneider Electric Innovation Platform

Schneider Electric Innovation Platform

EcoStruxure™ Innovation At Every Level

For Industry 4.0

Life Is On Schneider Electric

Physical Robotic System Solutions

Development & Delivery Approach

Schneider Electric Collaborators & Partners

Mobility/Platform

Schneider Electric & Subsidiaries

Analytics (Video, etc.)

Services & Local Support

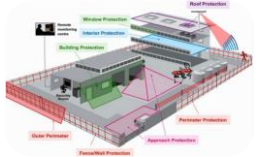
Integration (Payloads/Sensors, Software, TeleComms) & Services

End to End Robotics Inspection Solution

Recent Use Cases

Safety Officer

- PPE Detection
- PTW Interface
- Abnormal Behavior Monitoring
- Evacuation Support
- Environment Monitoring
- Gas/Fire Detection
- Integration w/ Control Room for alarms/events



Security Officer

- Guard Tour
- Intrusion Detection
- Face Recognition
- Abnormal Behavior for threat detection
- Un-Identified / Dangerous Object Detection(Threat)
- Unauthorized Access detection
- Integration w/ Control Room for alarms/events

Remote Op. Officer

- Remote Site Inspection
- Live Feed to Control Room
- Security Features like intrusion detection etc.
- Process Environment Monitoring
- Auto Operation incase of Communication failure
- Integration w/ Control Room for alarms/events

Health Officer

- Face Mask detections
- Social Distancing
- Person Temperature Detection
- Announcement
- Integration w/ Control Room for alarms/events

Payloads

Barcode scanner

Optical / Thermal Camera

5G Router

Digital Signage

Speakers

Gas Analyzer

Printer

RFID

Recent Proof-of-Concept Customer Implementation

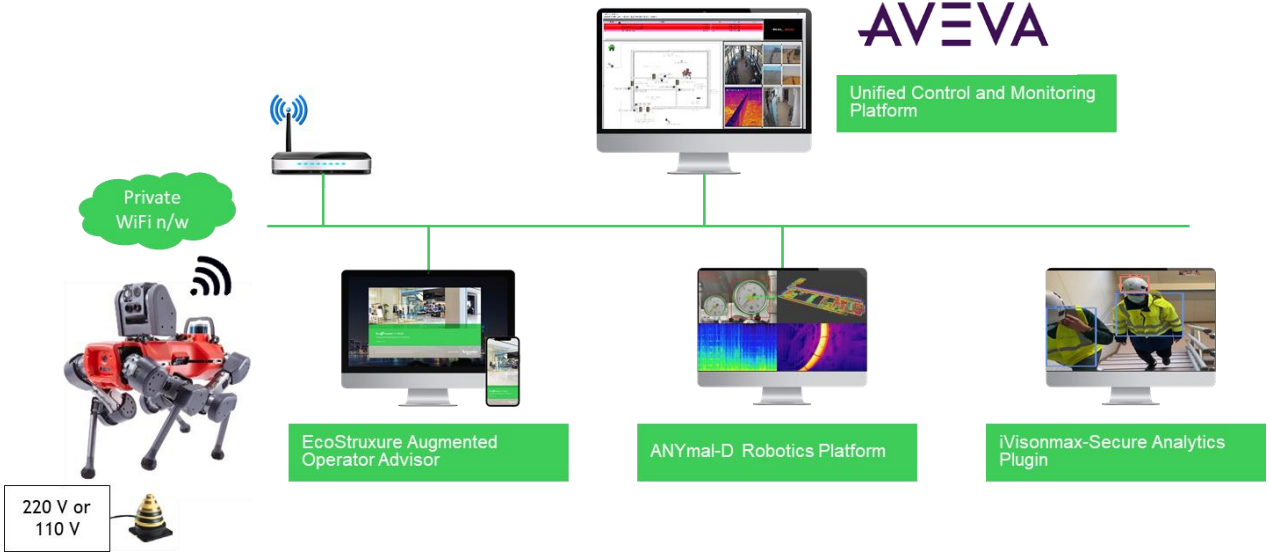
Locomotion tests performed

- Walk over flat concrete, metal gratings & inclined terrain
- Climb up/down: single step, stairs
- Walk through narrow passages
- Walk underneath equipment

Data collection/processing from onboard sensors to **Command Control Center**

Remote Inspection Use Case: visual, gauge reading, thermal imaging & acoustic measurement, Augmented Reality

HSE Use case: Detect PPE (includes helmet & safety vest), Mask detection, Social distancing



Key Takeaways

- Routine inspections in hazardous areas to ensure people safety.
- Avoid human errors in repeated tasks for data collection
- Ensure HSE compliance 24x7

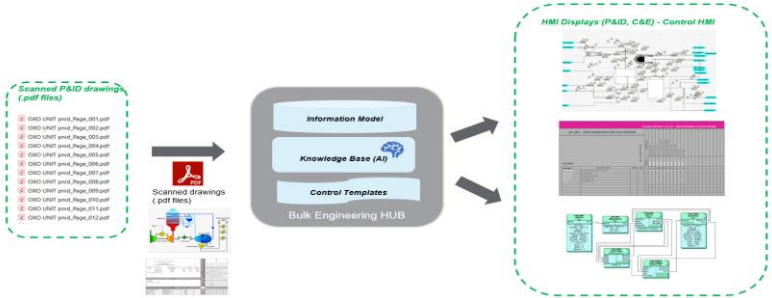
Recent **Virtual** Robotic System Solution Examples

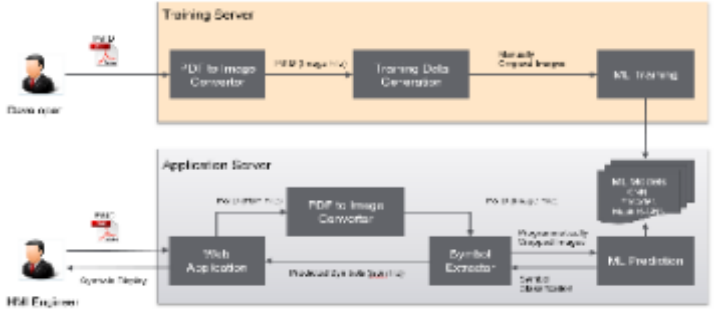
A robot is understood to be any system w/ AI that makes decisions & performs actions w/o (or w/ minimum) participation of a person based on data available to it

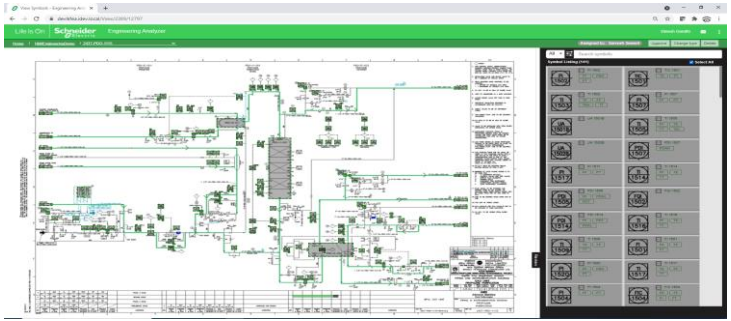
Engineering Analyzer

Automatic identification of symbols, alarms & other meta data from scanned drawings using image processing & ML to automatically create HMI displays (P&ID, C&E display) & Control Application. Benefits:

1. Reduce HMI Engineering efforts by ~80%
2. Improve Quality by reduction in human errors involved in graphics generation
3. Step to achieve the “ZERO ENGINEERING” vision with automation and latest State-of-the-art technologies



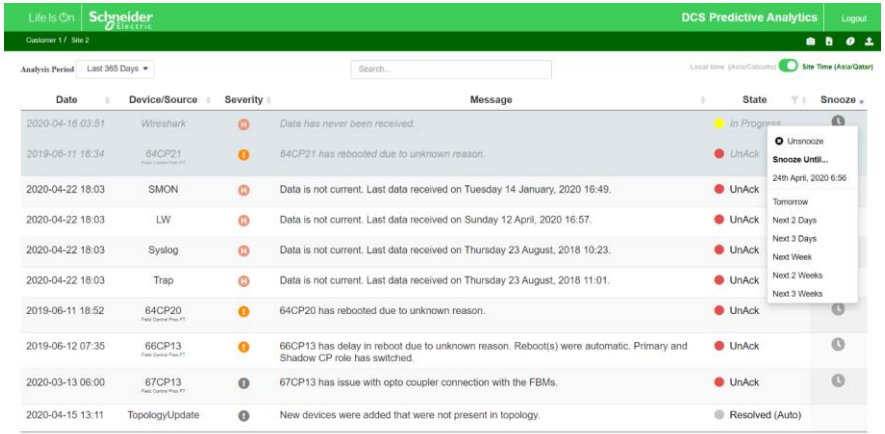




DCS Predictive Analytics

Collects all logs and analytics them for potential issues. It detects and predicts faults, identifies the root cause and recommends action to fix the problem. Benefits:

1. Minimize unplanned downtime
2. Save manpower from performing the tedious monitoring activities



Conclusions

Conclusions

- Robotic (physical & virtual) solutions quickly emerging & have key role to play in future of autonomous & operator-assisted plants
- Different SE/Partner robotic solution integration using SE Ecostruxure Platform opens up immense opportunities
- SE can offer end-to-end robotics solutions, working w/ customers & partners to define the appropriate robotic platform, needed payloads, software & network infrastructure to best meet target use case requirements
- Ability to efficiently integrate robots w/ different payloads & plant control/other systems critical to mission success