The Industrial Manufacturing Processes Demand That Machine Guarding Solutions Become Adaptable to Dynamic Manufacturing Techniques with Diverse Functions.

A brief look into the challenges that machine guarding solutions are confronted with and how new process functions will be changing previously accepted solutions.

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Evolution of a Factory and the Human Task

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Electronic Sensing

- *Driven by:* Market requirements and technology
- *Effect:* Operator presence linked to control of machine
- *Verification:* Standards
- Sensors like safety mats, light curtains and scanner technology are more often now put into place to remove physical barriers
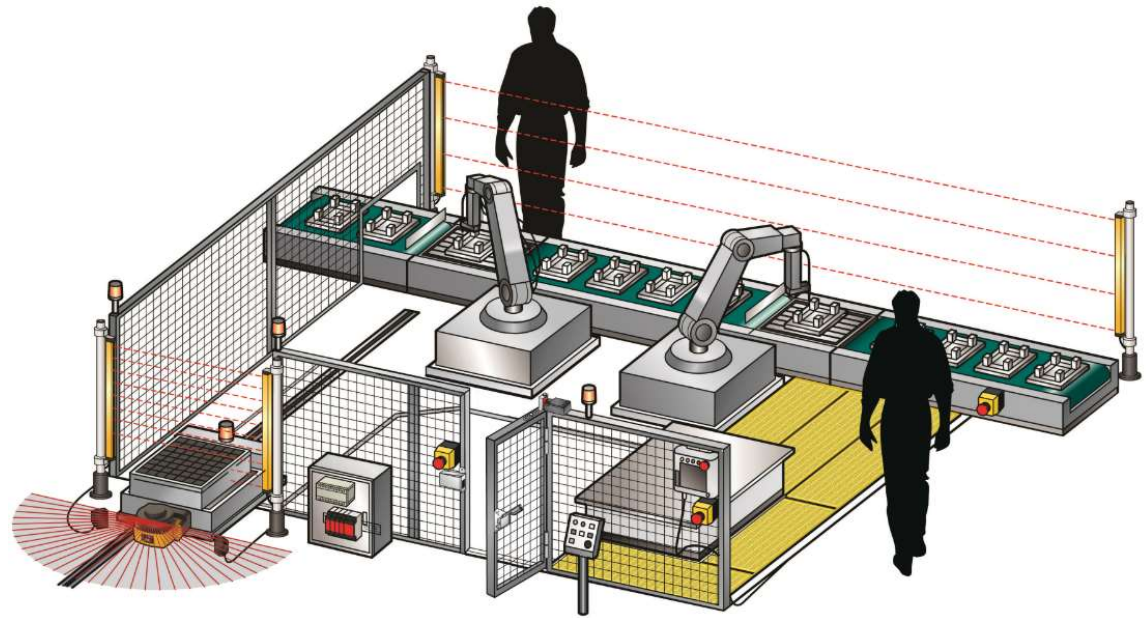
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Integrity Monitoring

- *Effect:* Increased complexity & user confusion
- *Verification:* Standards & third-party certification
- Functional safety becomes required by OEM designs in addition to the end user's risk assessments

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- New safe presence sensor technologies and programmable protective operating zones are becoming a necessity in multiple zones that overlap

- High speed sharing of information with safety controls are now being developed in a virtual factory floor. This is now, more than ever, needed as we are dependent on safe space distance when replacing these physical barriers with presence sensing and machine automated equipment rate, force, and time in addition to the angular approach

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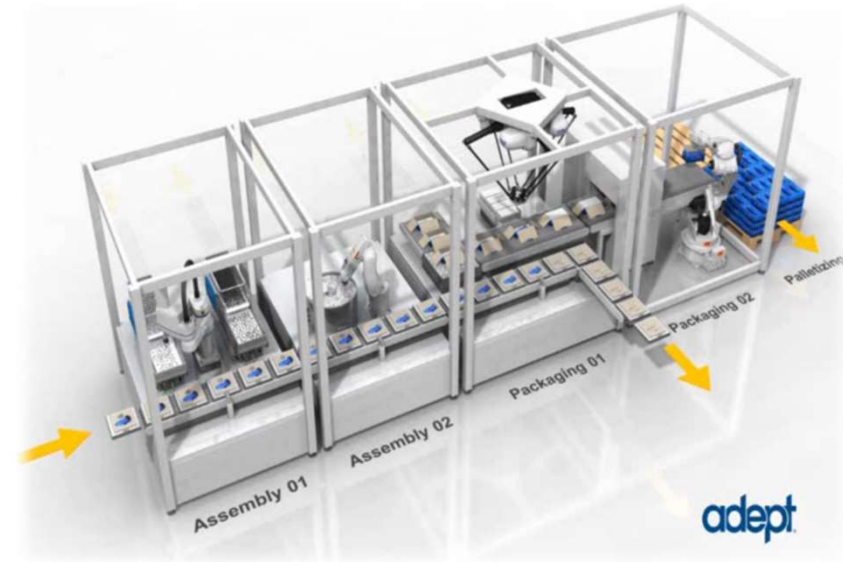
## System Functional Safety with Integrated Safety

- Designers and builders need new technologies for faster decisions to protect humans from these dynamic installations with the use of embedded safety in state-of-the-art sensors

- Movement of machines becomes dynamic and so safety validation is now a standard expectation

- Movement and force monitoring versus rate of production are topics that need to be focused on

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- The drive for a plant to change is evolving yet again
- Safety now has now a mobile 3D envelope and invisible restricted space requires more variables processed

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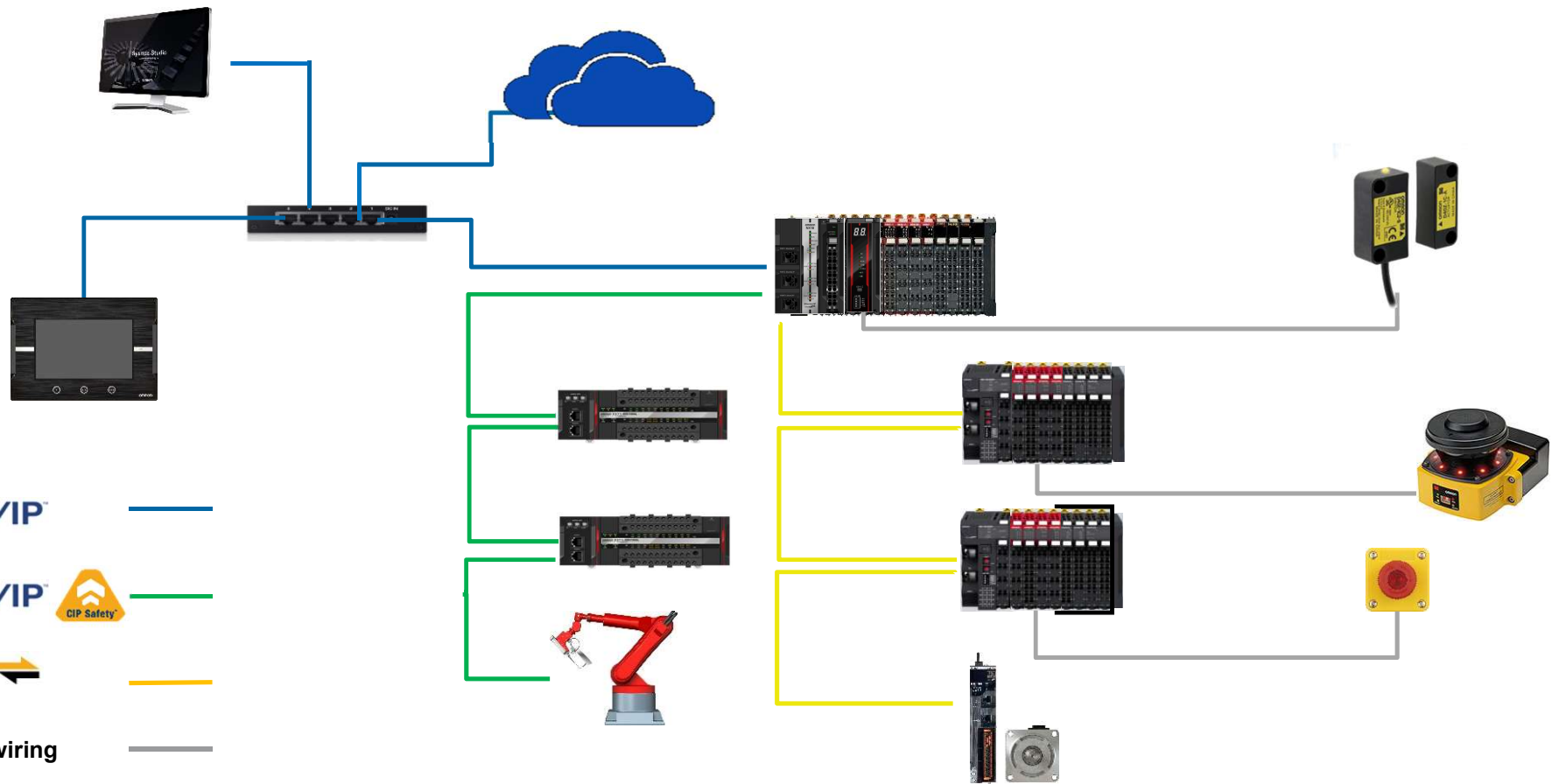
EtherNet/IP™ ——

EtherNet/IP™ CIP Safety™ ——

Safety over EtherCAT® ——

Discrete Hardwiring ——

Serialization and Traceability

Tracking and quality control driven by customer demand and regulatory requirements
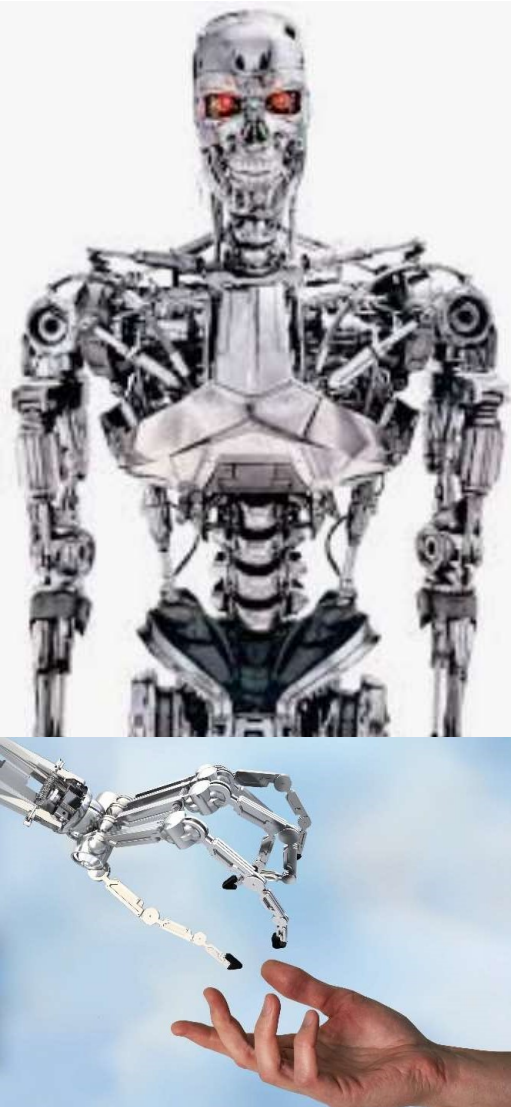
Product and supply chain tracking

Regulatory requirements

Quality control

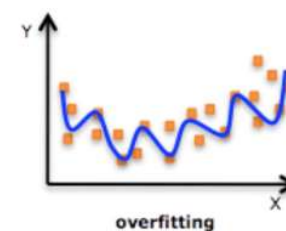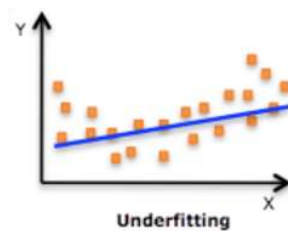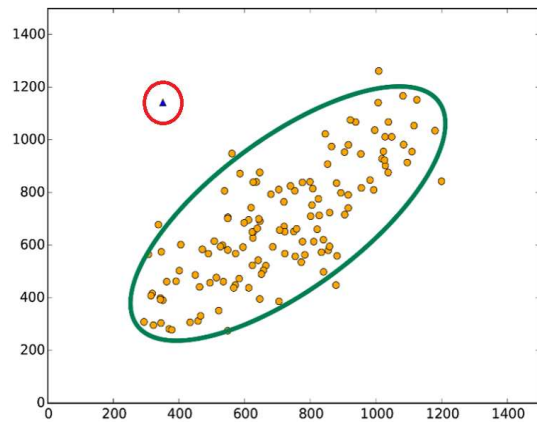# Solutions: Artificial Intelligence (AI)

Machine that can perform tasks that are characteristic of human intelligence while processing variables

- Provides faster processing power
- Variables processed differently: recognizing objects, position movement rate of change, and differences in pattern or behavior
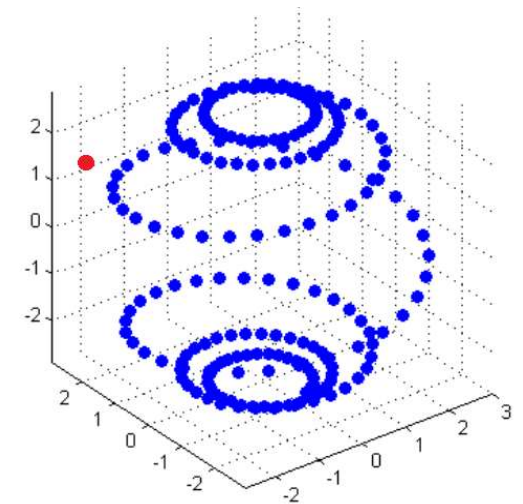- Learning : problem solving…

Detection of outliers in real time

- Two features alone are not an abnormality, but two features combined are
- Detection of three features causing abnormally needed
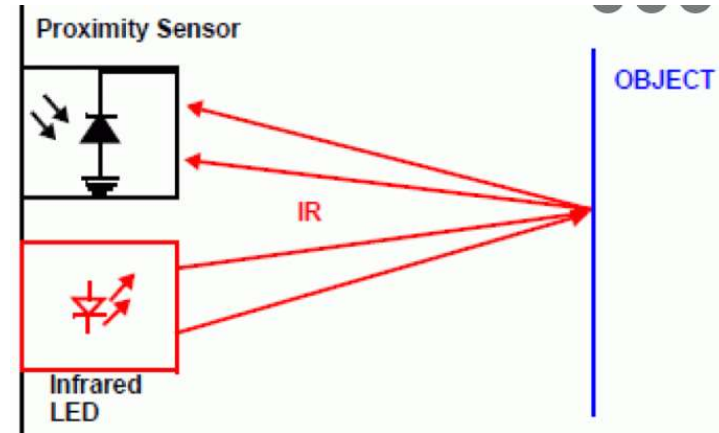
Two Features

Three Features

New look of the factory controls

- Artificial Intelligence technologies introduced
- New sensor technologies being safety approved combines technologies at larger volumes in data analysis
- Dynamic Functions can be defined
- Diverse functions can be targeted
- New Functions can be defined with behavior limits
- 3D workspace can then become defined
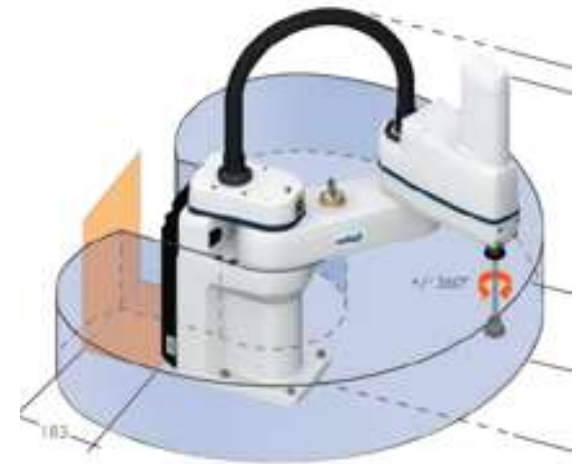
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Safety PLC: Key Safety Controller Features

- Automatic configuration restart
- Automatic programming
- Simple automatic test
- Online safety function verification
- Direct HMI connectivity
- SD RAM backup and restore
- Data-logging
- CPU display
- Hybrid systems (FSoE and CIP safety)

Next in Safety: Sensors

- Advancements in optical sensing using combined technologies
- Line of sight sensors with no moving parts
- Miniaturizing sensors

Thank you