Balamurugan Balakreshnan (Bala)
Cloud Solution Architect – Data and AI

Industry 4.0/5.0

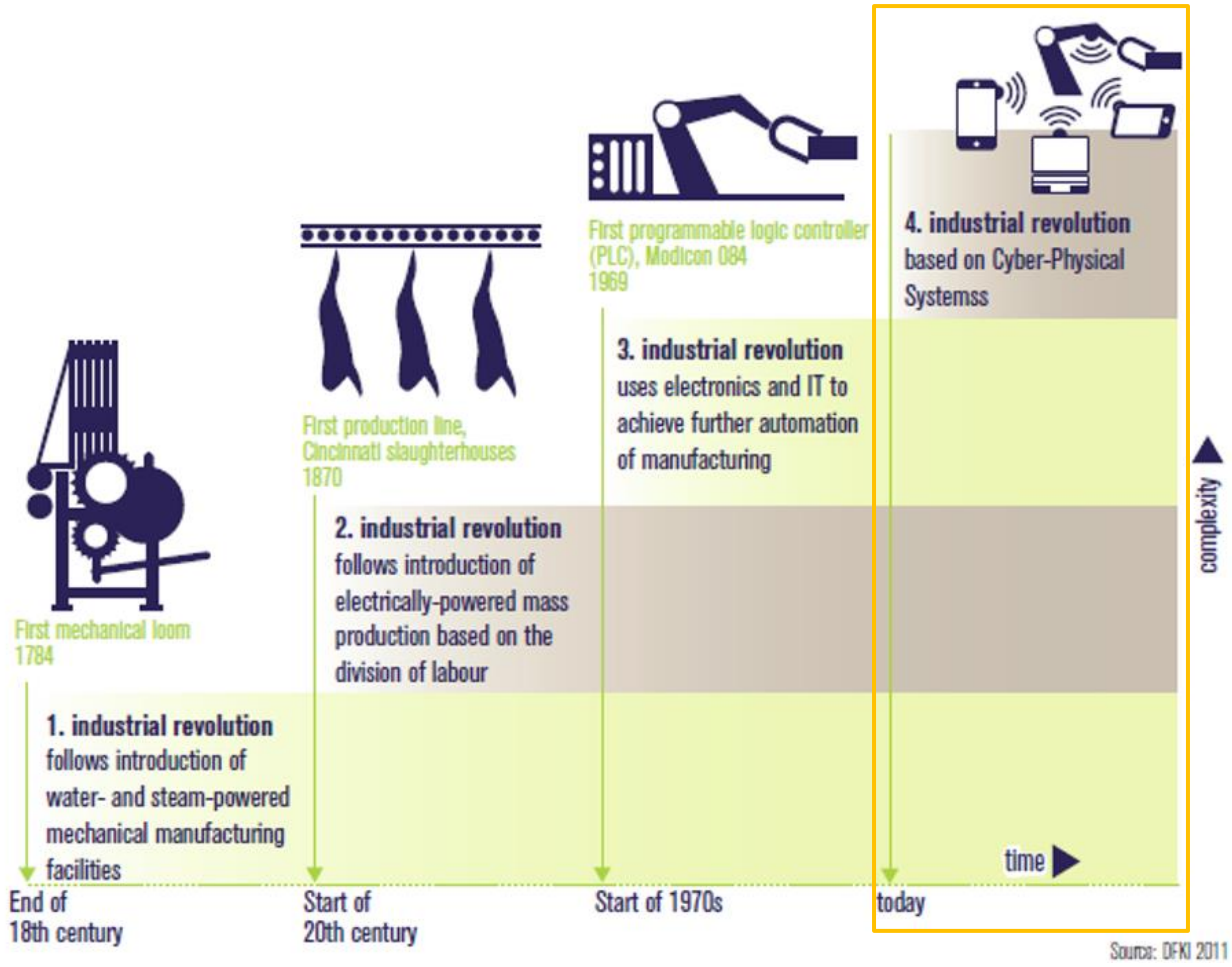
Digital Manufacturing

Industry 4.0

Industry 4.0 is a project in the high-tech strategy of the German government, which promotes the computerization of traditional industries such as manufacturing.

The goal is the intelligent factory (Smart Factory), which is characterized by adaptability, resource efficiency and ergonomics as well as the integration of customers and business partners in business and value processes.

Technological basis are cyber-physical systems (CPS) and the Internet of Things.

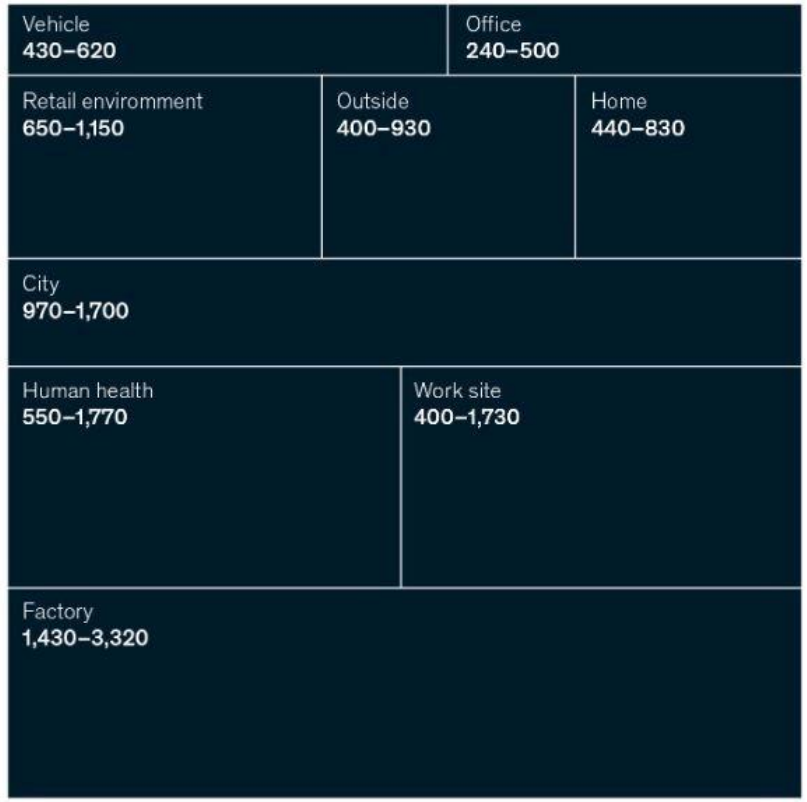


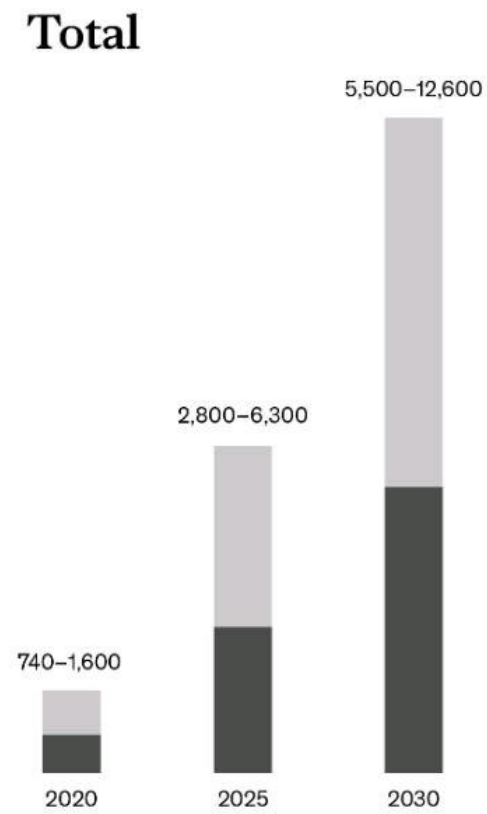
Source: http://en.wikipedia.org/wiki/Industry_4.0

Source: acatech

The Internet of Things' large and growing economic-value potential is concentrated in nine settings where the technology is deployed

Estimated 2030 economic value of Internet of Things adoption, by setting,
$ billion





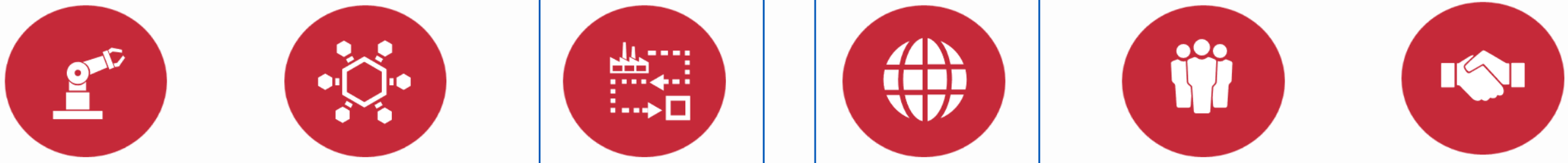
McKinsey & Company

Note: Segment sizes based on high-end estimates.
Figures may not sum to listed totals, because of rounding.

Digital Manufacturing Adoption - Impact

*Digital Transformation is not just about **HAVING** technology,*
*Its about **LEVERAGING** technology to create value to the organization.*

DIGITAL TRANSFORMATION

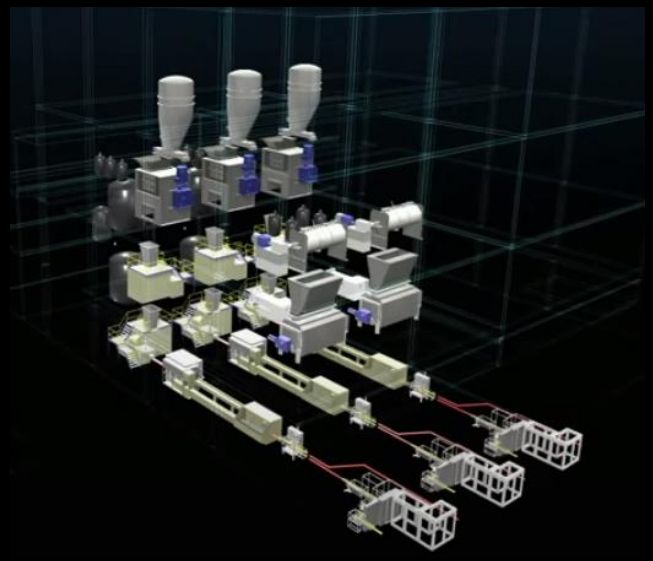


Together partners create transformational change

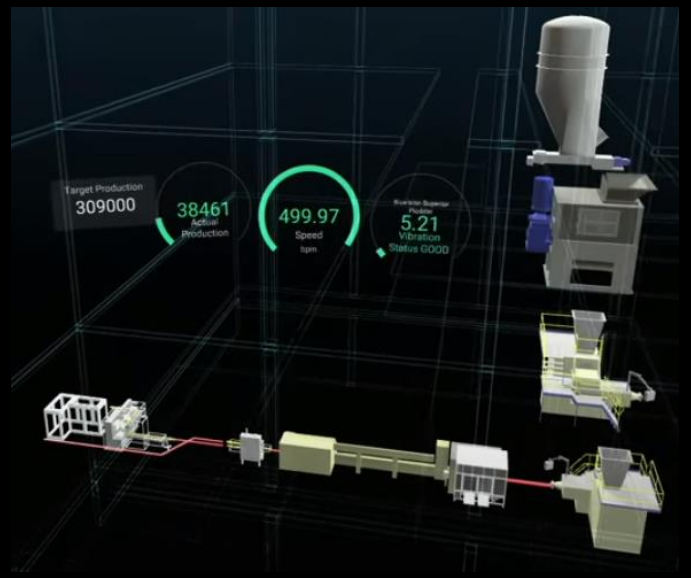
Talent | Innovation | Adoption

Unilever : Digital Twin in Factories and Supply Chains

3 lines in Valinhos



500 bars soap/min

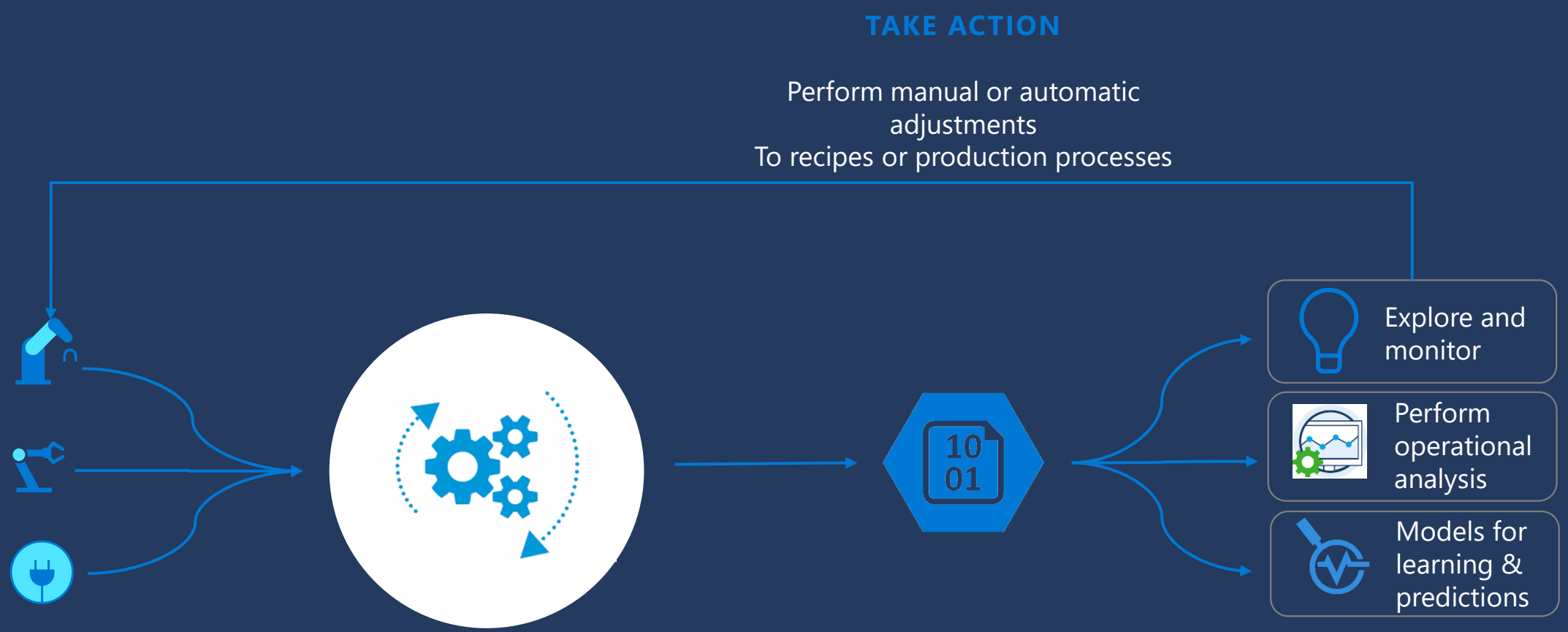


real-time optimized control

Digital Twin + AI - «*2,5 millions euro savings* » Unilever, Dave Penrith, Chief Engineer

Soap-making control variable real-time using Advanced Process Control for optimal consistency i
« soap-making » *operators don't want to switch if off anymore !*

Industrial IoT Data Pipeline



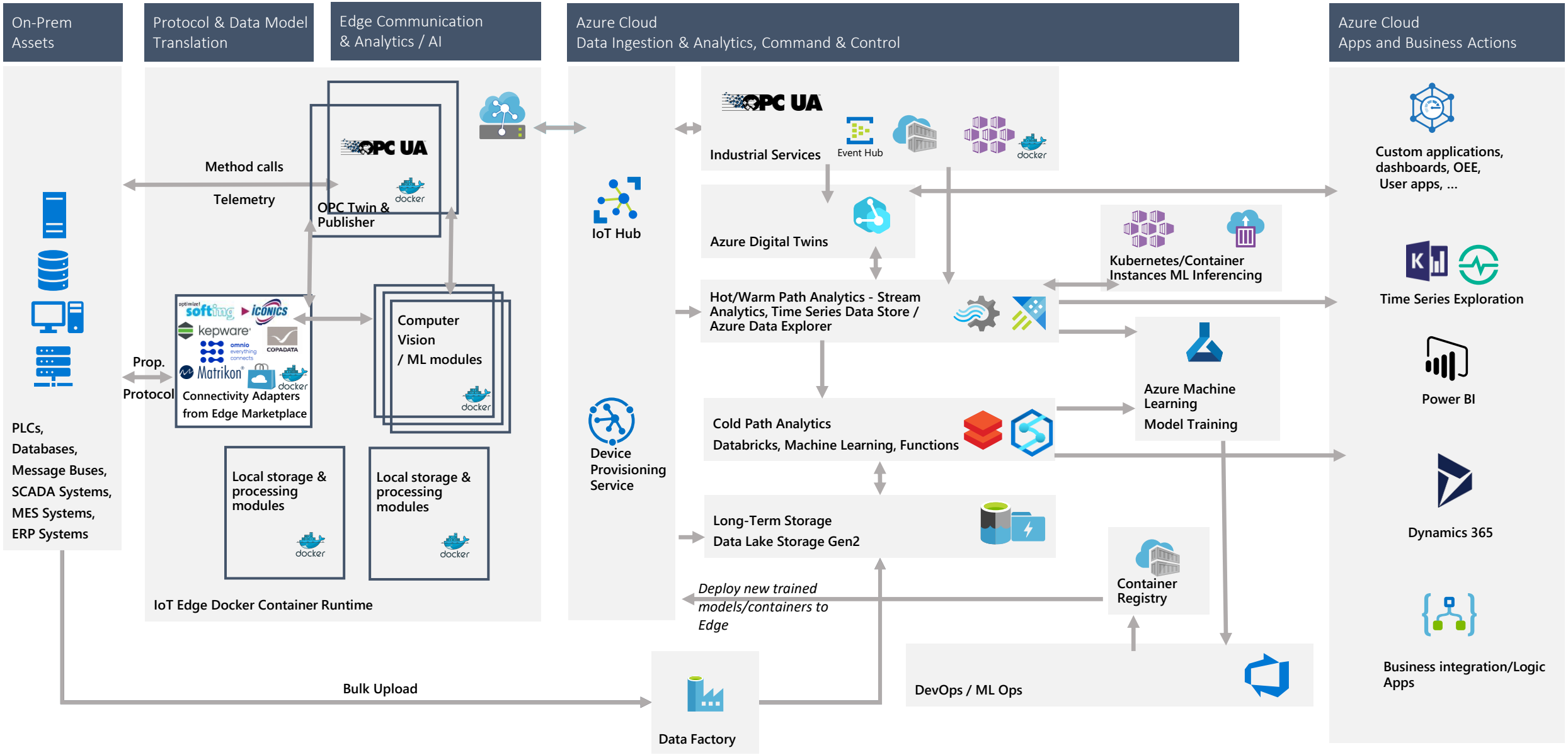
Collect data from different sources

Translate, Normalize, Contextualize & Enrich

Store in different (hot, cold) data stores, optimized for analytics

Run queries for monitoring
Perform asset-based analysis
Use models for machine learning and make predictions

Azure Industrial IoT Reference



Academia is Transforming

Strategic shift towards "Workforce of the Future" collaboration with Industry

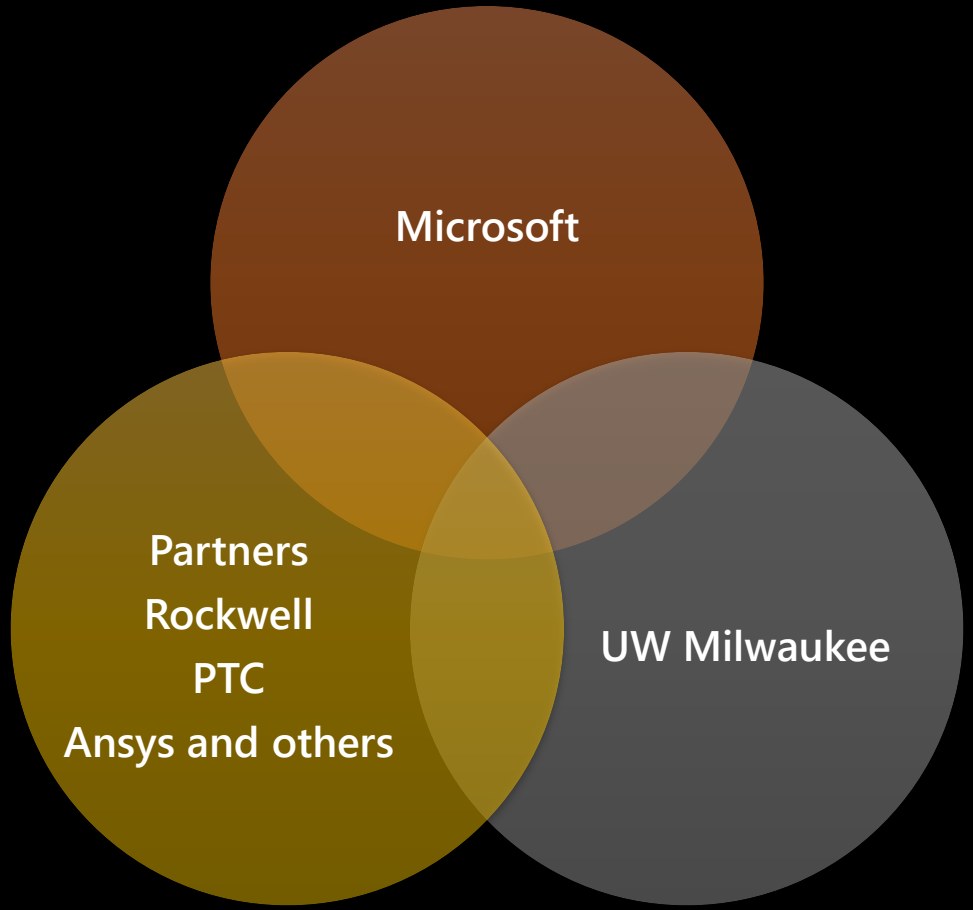
1. **Data informed academic Investment and economic impact models**
   - Skills more aligned with Industry needs/projections
   - Flexible educational models- school, 2–4-year degrees, certifications and upskilling

2. **Policy Shift** towards execution - state, regional , national workforce of the future for manufacturing competitiveness
   - Scale to meet Industry skills demand
   - Supply chain resilience
   - DOD/DOE/DOL, NMII's, Made in China 2025, EU, UK Innovate and Catapult network. 4IR,Ind 4.0.....
   - Incentives-Act 59 in Wisconsin-$1,000/school/student/industry credential.

3. Technology interoperability , but lagging **ind 4.0 applied workforce standards**
   - creating space for thought leaders/marketeers
   - New and emerging occupations

4. **Cybersecurity** an immediate priority and then other key **Ind 4.0 pillars** –AI,ML, Data, cloud compute, AR

Empower Students with skills needed for today and future



Academic Engagement-COE Pillars

Bridge between Industry and Academic Institutions to proactively build the Future workforce

Access & Sustainability

- **Academic Institution Access** within co-investment philosophy
- **COE-** share best practices, process and scalable learnings globally.- Diversity, Equity & Inclusion
- **Internal collaboration** for greatest external impact-GSMO, Industry Teams, Corp Strategy

Thought Leadership & Partnering

- **Reference projects**-learn from each project and continuously improve with project management for small through complex projects- “proposal to execution” linked to strategy
- **Microsoft Eco-System** engagement with alliance partners, Customer, End Users
- **Academic Network** and eco-system partnering to maximize impact and scalability

Programs & Workforce Standards

- **Engagement framework** for institutions- school, community college, University, Institute – curriculum, facility, process
- **Industry led workforce development** approach to programs-pro-active
- Scalable **Industry 4.0/Cloud/AI/ML workforce standards and certifications**

UWM Connected Systems Institute

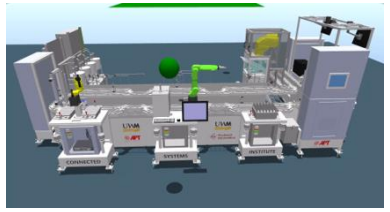
UWM CSI Success

Bridge between Industry and Academic Institutions to proactively build the Future workforce

UWM Connected Systems Institute

Education Facility

- Line Built ✓
- Data center ready ✓
- OT networking ✓
- OT/IT connectivity ✓
- Cyber Security ✓
- MES
- Cloud Scale Analytics ✓
- Hybrid AI/ML
- Industrial Metaverse
- Sustainability in MFG



Skilling Workforce

- IoT/AI MFG Intro Certs ✓
- AI in Business ✓
- Digital MFG classes – WEDC funded ✓
- AI in MFG
- Certification course
- IoT Carts ✓
- Industrial IoT Carts

Partners

- University of Wisconsin Milwaukee
- Rockwell Automation
- PTC
- Fanuc
- APT
- Cisco
- Fortinet
- Haskell
- Endres + Hauser
- We Energies

Microsoft Azure for Manufacturing Excellence (AME)

Objectives:

1. Develop learning pathways levering Microsoft training tools and certifications oriented to specific job titles.
2. Initiate drive to campaigns to identify student candidates
3. Matchmake student candidates with mentors from industry and CSI.
4. Market graduate credentials to identify tuition funding and sponsorship.

Data Engineer
Fundamentals Data Fundamentals
Designing a Data Solution
Implementing Data Solutions

Azure AI Engineer
Fundamentals AI Fundamentals
Designing & Implementing AI

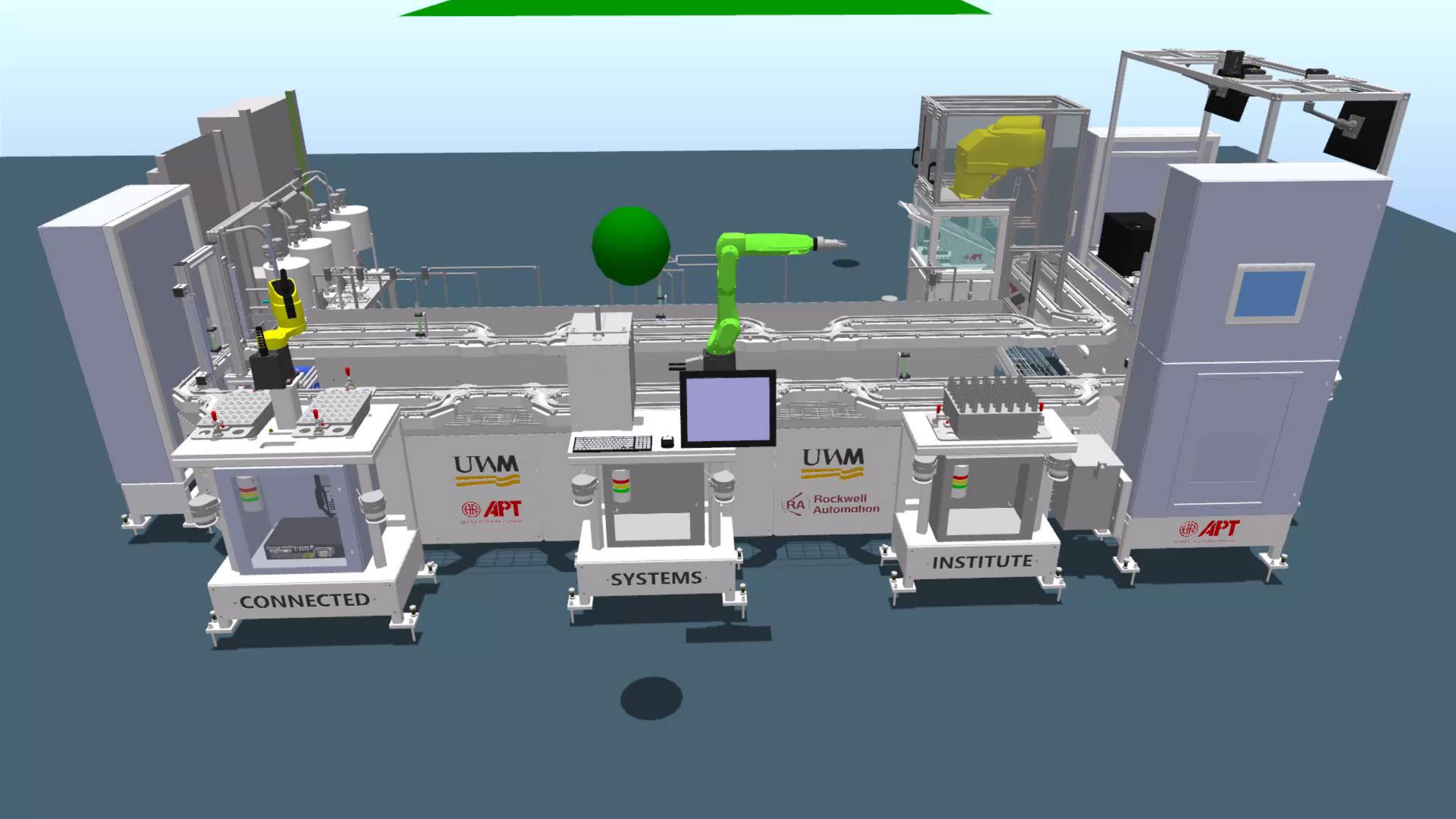
Azure IOT Developer
Fundamentals Data Fundamentals IOT Developer

Azure Data Scientist Associate
Fundamentals AI Fundamentals
Designing & Implementing a Data Science Solution

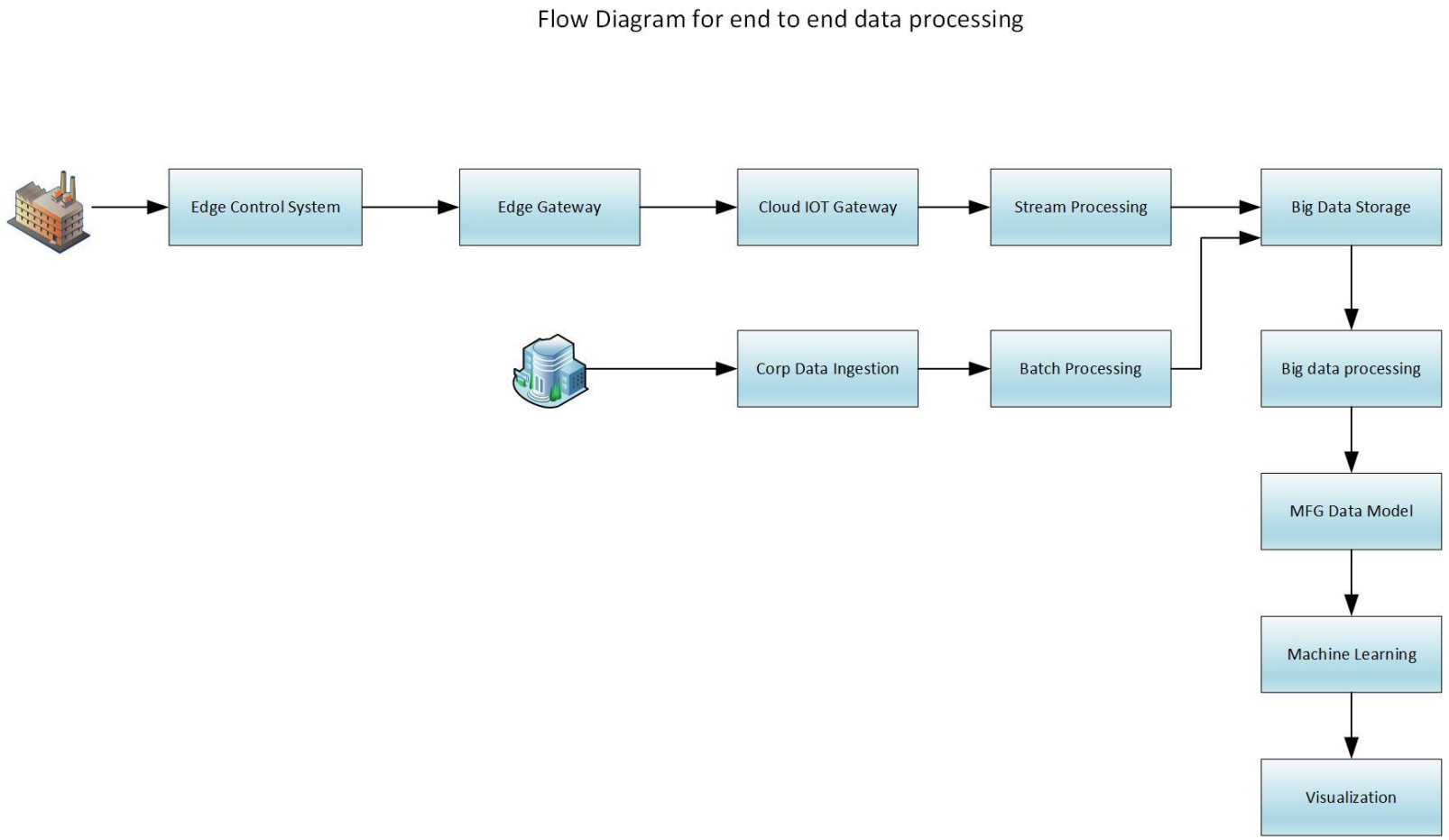
Expected Outcomes:

1. Generate attention to value of CSI programming to Federal, State and Local funding agencies.
2. Attract direct funding for displaced workers to sponsor their tuition.
3. Increase the number of students and employers interacting through CSI.

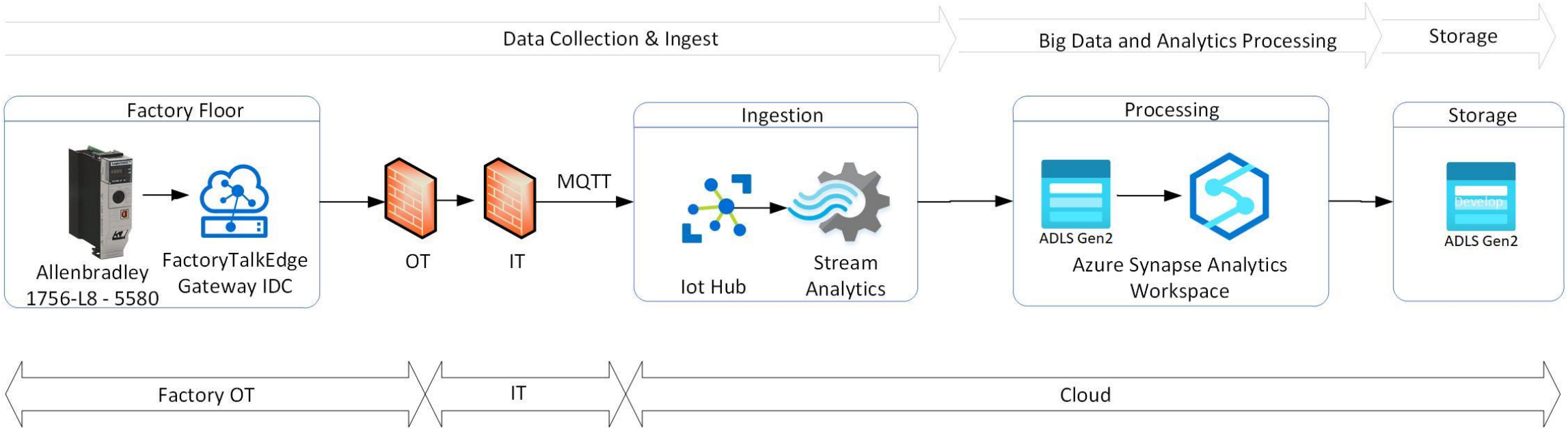
Learners graduating from these pathways earn Microsoft Credentials certifying
KSA's Microsoft base curriculum is delivered with hands on experience in CSI Labs
Special focus on use cases relevant to the manufacturing environment.


UWM
APT
UWM
RA Rockwell Automation
APT
CONNECTED
SYSTEMS
INSTITUTE

CSI Factory of Future - Cloud

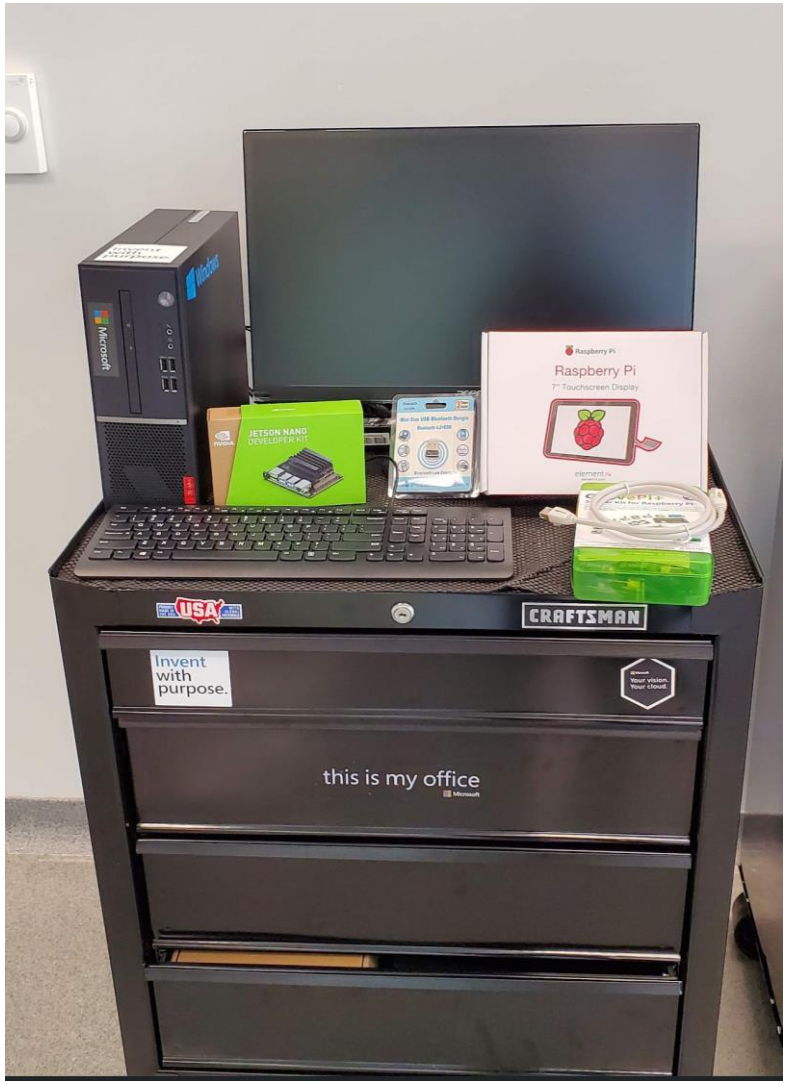


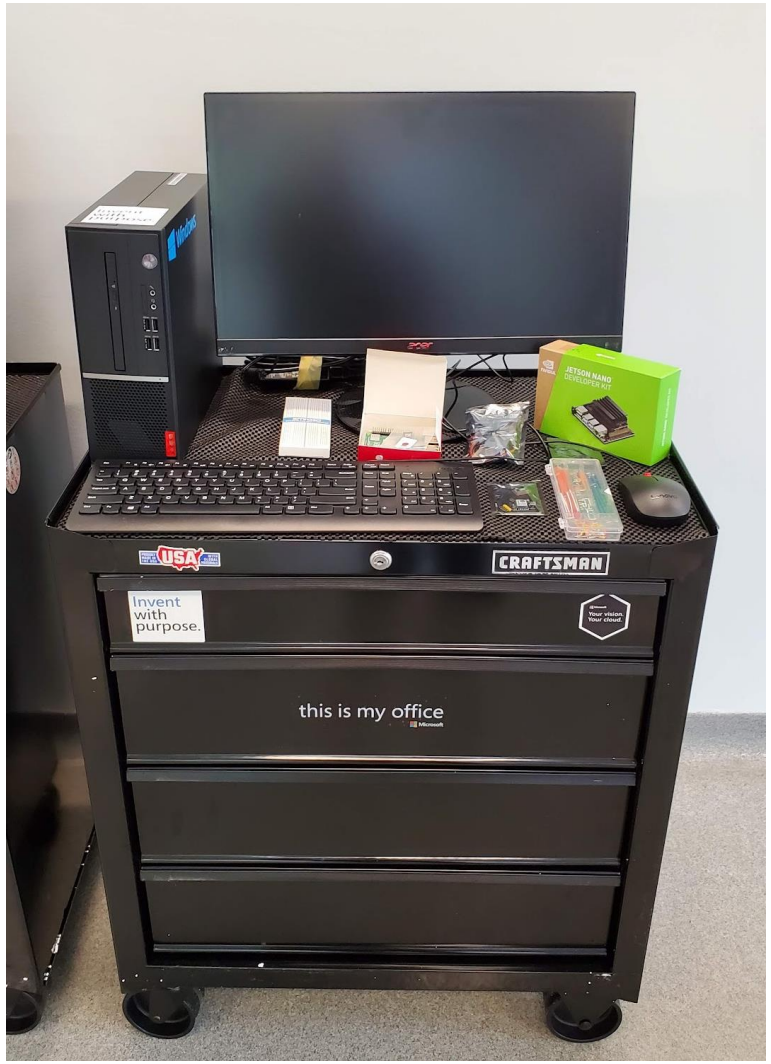
Cloud Architecture for CSI Test Bed – Factory IT/OT connectivity



IoT Cart for Students

[Link]





Industrial IoT Cart

Machine Learning and AI addresses a range of scenarios

High-yield use cases that transform Manufacturing

Quality Assurance

What are the root causes of recurring problems?

(so I can redesign product, process, training)

Demand Forecasting

What sales or usage volume can I expect?

(so I can optimize my staffing and asset utilization)

Production Scheduling

What factories, lines, teams, machines, people…are most effective ?

(so I can identify best practices and allocate resources)

Anomaly Detection

What machines are not performing properly?

(so I can immediately investigate)

Predictive Maintenance

What is the likelihood this part/machine will fail?

(so I can prevent it from happening)

Supply Chain and Inventory Optimization

What is right level and supplier for a part?

(so I can simplify and optimize procurement)

- liot
- CSI factory to cloud
- Quality vision AI

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- Internal Only – do not share

Academia-Industry Eco-System

By combining strengths with stakeholders across government, education, and industry sectors, we address workforce challenges critical to the future growth of manufacturing.

Increased industry relevance:

Infuse industry value and relevance to existing curriculum and teaching methods.

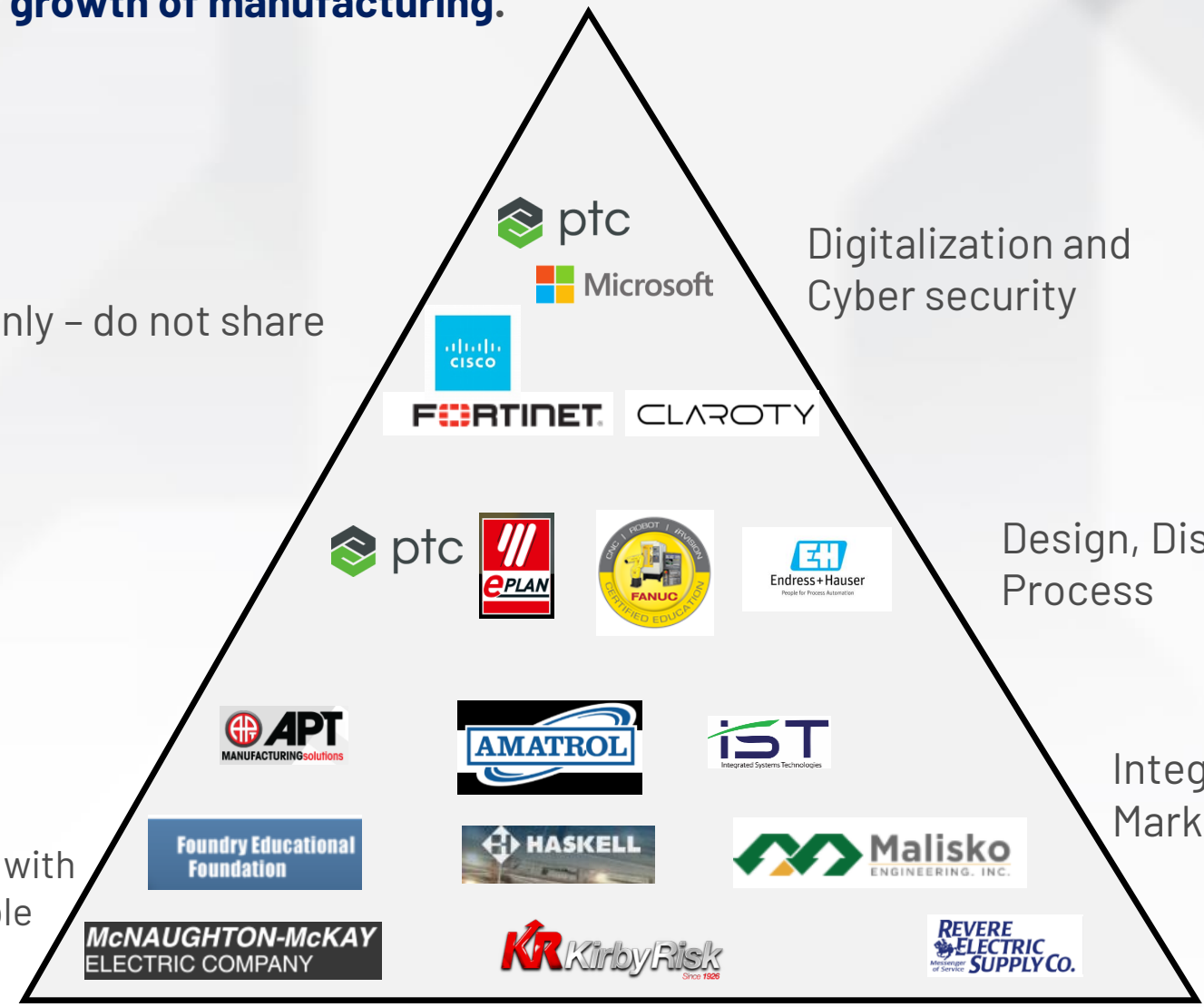
- Internal Only – do not share

Integration of disciplines:

Provide students an opportunity to learn with integrated technologies and develop multi-disciplinary skill sets.

Increase learning institution responsiveness:

Industry standards allow learning institutions to respond to new technology adoption and prepare students for emerging high demand occupations with tighter links to industry, and sustainable/adaptable learning environments.



Representative, examples, not exhaustive

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- **Engagement framework** for institutions- school, community college, University, Institute – curriculum, facility, process
- **Industry led workforce development** approach to programs-pro-active
- Scalable **Industry 4.0 workforce standards and certifications**

Core consultative team, focused on differentiation, eco-system impact, quality and scale