Accelerating Industrial 4.0 with Azure IoT

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MICROSOFT TO INVEST $5 BILLION IN IoT

Our goal is to give every customer the ability to transform their businesses, and the world at large, with connected solutions.

Azure, Azure IoT Edge and IoT Devices

Azure
- Azure IoT Central (SaaS) and Azure IoT Solution Accelerators
- IoT Hub & other PaaS services needed for IoT
- Deploy and manage cloud services
- Collect telemetry, send commands, manage software and firmware
- Managed by Azure or Azure Stack
- Azure IoT Edge runs on Windows and Linux

Azure IoT Edge
- Windows IoT, Linux

Azure IoT Device SDK
- Collect telemetry, send commands, manage software and firmware
- Multi-device, multi-language, multi-OS
- iOS, Android, Windows, Linux
- 1000 devices certified from 220 partners

Azure Sphere
- Industry leading security for MCU devices
- Connect directly to Azure or Azure IoT Edge
- Linux Kernel that modernizes MCU devices

Azure Sphere OS

IoT Edge
- Windows IoT, Linux

IoT

IoT Device SDK
- Multi-device, multi-language, multi-OS
- iOS, Android, Windows, Linux
- 1000 devices certified from 220 partners
Azure leads Digital Transformation in Industrial IoT

- Manufacturing is complex by nature
  - Long life cycles to modernize machinery
  - Isolated business processes
  - IT vs. OT conflict

- Azure reduces IIoT complexity by providing a secure cloud platform based on Open Standards

- Biggest contributor to open-source OPC UA foundation

- Largest partner ecosystem to optimize automation processes and enable new business models

Azure believes in Open Standards and Interoperability
Step by Step to Digital Transformation

1. Computerization
   - PLCs/IPCs
   - What Data? “Defining Tags”

2. Connectivity
   - Edge Gateways
   - How to Connect? “Plugging in”

3. Visibility
   - Telemetry

4. Transparency
   - Dashboards
   - Time-Series/Historical Data, Hierarchical Data Modeling

5. Predictions
   - AI Models, Machine Learning

6. Adaptability
   - Digital Feedback Loops, Method Calls

7. Services
   - “Pay-as-you-go”, Outcome-based Products

- “Self-optimizing”
- “Being prepared”
- “Understanding”
- “Seeing”
- “Plugging in”

How can an autonomous response be achieved?

Value

Time
Azure support every step on the digital transformation journey

Value

Time

1. PLCs/IPCs Computerization
2. Edge Gateways Connectivity
3. Telemetry Dashboards
4. Time Series/Historical Data, Hierarchical Data Modeling
5. AI Models, Machine Learning
6. Adaptability
7. Digital Feedback Loops, Method Calls

Products that never break Optimized processes

Digital Transformation for the customer

Services

Azure IoT ecosystem (to enable brownfield & greenfield scenarios)

Azure IoT platform and services

Azure Data Platform and AI

Azure D365 and 3rd party providers (SAP, etc.)
Brownfield Enabled & Consistent Cloud Data Model

No winner in the field bus/industrial ethernet wars!

<$500
+ No changes to machines required!

Consistent, compatible data model for all machines, plus security!
Azure Industrial IoT Reference Architecture

On-Premises: Device Connectivity

- OPC UA Publishers
- OPC UA Proxy Modules
- Azure IoT Edge

Azure Cloud: Data Ingestion & Processing, Command & Control

- Azure IoT Hub
- OPC UA Publishers
- OPC UA Proxy Modules
- Azure IoT Edge

- Hot Path Analytics:
  - Azure Stream Analytics
  - Azure Time Series Insights...

- Cold Path Analytics, ML, Functions & Storage:
  - Azure Machine Learning
  - Azure Data Lake
  - Azure CosmosDB Graph...

- OEE, KPIs calculation
- Latest Telemetry Value
- Alarms & Events
- Cloud-based Machine Management
- OPC Clients & Servers using OPC UA .NET Standard stack

Presentation & Business Connections

- Websites, Mobile Services
- Dynamics, Notification Hubs
Azure leads with open standards – OPC UA

- Azure provides OPC UA Pub/Sub reference communication stack
  - telemetry data to the cloud
  - non-intrusive data collection
  - Uploading entire data models

- Azure enables OPC UA Client/Server communication to the cloud and back
  - service-assisted communication
  - browsing UA data model
  - command execution

- Native OPC UA Data Models in Azure
  - Efficient data modelling
Demo - Connected Factory & OPC UA
Robotics condition monitoring dashboard demonstrates vendor-independence

Access any of your robots, of any robot brand, at any time, anywhere in the world!
Azure-Powered Industrial IoT Edge Gateways and Solutions
The Industrial IoT Starter Kit – HPE + Softing + Microsoft

OPC UA
OPC Classic brownfield
  • Siemens
  • Rockwell
  • Mitsubishi
  • ...

Industrial IoT Starter Kit

• dataFEED OPC Suite
• OPC Proxy
• OPC Publisher
• Windows 10 IoT Enterprise
• HPE GL20

Azure IoT Suite Connected factory
• OEE
• Analytics
• ...

Other applications and services
Azure support every step on the digital transformation journey.

- **Value:**
  - Azure IoT ecosystem (to enable brownfield & greenfield scenarios)
  - Azure IoT platform and services
  - Azure Data Platform and AI
  - Azure D365 and 3rd party providers (SAP, etc.)

- **Time:**
  - PLCs/IPC Computerization
  - Edge Gateways Connectivity
  - Telemetry Dashboards
  - Time-Series/Historical Data, Hierarchical Data Modeling
  - Time-Series/Historical Data Modeler and AI Models, Machine Learning
  - Predictions
  - Adaptability

- **Actions:**
  - Digital Feedback Loops, Method Calls

- **Insights:**
  - Digital Transformation for the customer

- **Things:**
  - Products that never break Optimized processes

- **Services:**
  - Azure IoT platform and services
  - Azure Data Platform and AI
Azure Time Series Insights

Azure Time Series Insights is the best platform for time series data. It is ultra-scalable, fully managed, and built for IoT volumes of time series data.

- **Start in seconds, scale in minutes with a highly scalable time series data storage and management**
  - Schema-less store, just send data
  - No coding required to start
  - Easy event source connection

- **Get near real-time insights in seconds with fast throughput and writes for large volumes of time series**
  - Store, query and visualize billions of events
  - Unlimited users and queries
  - Query response in seconds.
  - Ingest 100’s of millions of sensor events per day

- **Compare multiple sites and assets by creating a global view of your IoT-scale data**
  - Compare disparate data
  - Share data with domain experts
  - Add multiple event sources

- **Build apps using Time Series Insights APIs to programmatically manage and query your data**
  - Management and Query APIs exposed
  - Multi-tenant scenarios for external applications
  - Deploy queries on behalf of other users

Azure Time Series Insights is the best platform for time series data.
Azure Machine Learning

AZURE MACHINE LEARNING SERVICES

- Experimentation and Model Management
- Notebooks
- IDEs
- Azure Machine Learning Workbench

AZURE

ON-PREMISES

- SQL Server
- Machine Learning Server

EDGE COMPUTING

TRAIN & DEPLOY OPTIONS

- Spark
- SQL Server
- Virtual machines
- GPUs
- Container services

- Azure IoT Edge
**SMT Optimization for PCB**

1. Adjust parameters of A1, A2, A3, A4, reduce defect inspection rate on AOI
2. Raise inspection ratio on AOI, reduce re-check effort on human.
Azure support every step on the digital transformation journey

Digital Feedback Loops, Method Calls, AI Models, Machine Learning, Time-Series/Historical Data, Hierarchical Data Modeling, Transparency, Predictions, Adaptability, Azure D365 and 3rd party providers (SAP, etc.)

Actions

Azure Data Platform and AI

Insights

Telemetry, Dashboards, Visibility, Transparency, Predictions, Adaptability

Things

Azure IoT platform and services

Azure IoT ecosystem (to enable brownfield & greenfield scenarios)

Products that never break Optimized processes

Services

PLCs/IPC Computerization

Connectivity, Edge Gateways, Telemetry, Dashboards, Visibility, Transparency, Predictions, Adaptability

Value

Time

Digital Transformation for the customer
Example – ML in IoT Edge

Today’s SCADA solution

Well site

SMS/email alert

Supervision site
IoT Edge and AzureML in action

Well site

Replaying pump readings

Azure IoT Hub

Modbus

Modbus

Azure IoT Edge
Azure enables scale through IoT PaaS services

- Azure enables Top 10 automation companies to leverage secure-by-default Azure IoT PaaS and focus on value creation
- Our partners (just a few):
  - Automation Companies
  - Machine Builders
  - Gateway and SI
  - Manufacturers

- Azure partners with builder ecosystem to offer predictive maintenance solutions, bundled with machines
- Our partners (just a few):
  - Siemens
  - ABB
  - Emerson
  - Beckhoff
  - Honeywell
  - KUKA
  - TAPIO
  - Homag
  - Leuze electronic

- Azure leverages specialized solutions integration to focus on process optimization; connectivity specialist for OT/IT interoperability.
- Azure enables manufacturers to focus on process optimization through digital transformation
## 6 easy steps to get started

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Determine <strong>what</strong> do you want to improve</td>
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<tr>
<td>2</td>
<td><strong>Experiment</strong> with simulated data on real, secure OPC UA servers</td>
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<td>3</td>
<td><strong>Connect</strong> real equipment <strong>without disruption</strong></td>
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<td>4</td>
<td><strong>Visualize</strong> manufacturing performance</td>
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<tr>
<td>5</td>
<td>Make <strong>operational improvements</strong> based on data</td>
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<tr>
<td>6</td>
<td><strong>Scale</strong> out</td>
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[https://cloud-platform-assets.azurewebsites.net/connected-factory](https://cloud-platform-assets.azurewebsites.net/connected-factory)