Cloud-enabled Smart Factory

AWS

▶ Manufacturing Industry Trends

Data is an enabler

Digitally "Executed" Manufacturing

Machine-as-a-service

Sustainability

Manufacturers are embracing digital technologies to transform, and leveraging data to make data-driven decisions, further automate processes, and leverage innovations like machine learning, computer vision, and robotics.

However, manufacturers are still challenged to squeeze out additional productivity, maximize their asset availability, and improve quality all while lowering costs. Manufacturers are recognizing their data as a valuable asset, which enables their digital transformation efforts. They are also looking to move away from manual inputs into their production processes with digitally executed manufacturing for production and quality optimization, and flexible product changeovers.

Connected machines offer flexible new ways for manufacturers to add production capacity versus buying equipment outright. Manufacturers are also looking to reduce water, compressed air, gas, electricity and steam consumption to lighten their energy footprint which helps save money and meet corporate sustainability objectives. The cloud plays a key role in all these trends.

▶ Why Amazon Web Services?

Cloud computing is the on-demand delivery of IT resources over the Internet. Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider like Amazon Web Services (AWS). The three main types of cloud computing include Infrastructure as a Service, Platform as a Service, and Software as a Service. Each type provides different levels of control, flexibility, and management so you can select the right set of services for your needs. AWS offers you a pay-as-you-go approach for pricing for over 200 services. With AWS you pay only for the individual services you need, for as long as you use them, and without requiring long-term contracts or complex licensing.

For more than 25 years, Amazon has designed and manufactured smart products and distributed billions of products through its globally connected distribution network using cutting edge automation, machine learning and AI, and robotics, with Amazon Web Services at its core. We understand factory operations. From product design to smart factory and smart products, AWS helps leading manufacturers transform their manufacturing operations with the most comprehensive and advanced set of cloud solutions available today, while taking advantage of security designed for the most sensitive organizations.

65%
of IndustryWeek's **50 Best Performing** U.S. Manufacturers
use AWS services

80%
Forbes' list of **Top 25 IoT Startups** to Watch in 2019
use AWS services

90%
More than **90% of Fortune 100** companies
utilize APN Partner solutions and services

"With Amazon EC2 Spot Instances, we easily save 85–90% in costs. That, in turn, allows us to experiment with less risk and ultimately develop higher- quality products for our customers."

- Joe Gardner, Principal Cloud Architect

"My working assumption a year ago was that the cloud wasn't as secure as a brick data center. Now, I'm convinced it's more secure and there's less risk. We definitely get that from AWS."

- Adrian Heeson, Operations Director

NATIONAL INSTRUMENTS

British Gas

▶ Use cases the cloud addresses within a Smart Factory

Production and process optimization

Quality Assurance

Predictive maintenance to maximize uptime

Digital Twin and Simulation

aws

Machine as a service

Supply Chain reinvention

Sustainability initiatives including WAGES optimization

Optimization of SAP, MRP and MES systems

AWS Cloud services address these use cases by helping manufacturers extract, structure and store data from a variety of current and legacy equipment into a Data Lake for a combined, single source of truth.

This data allows for detailed analysis and consumption to digitally transform in multiple functional and use case areas shown here to improve business operations. Data extraction and structuring tools, edge computing, Data Lakes, and machine learning services are making smart factories even smarter to optimize Overall Equipment Effectiveness, or OEE.
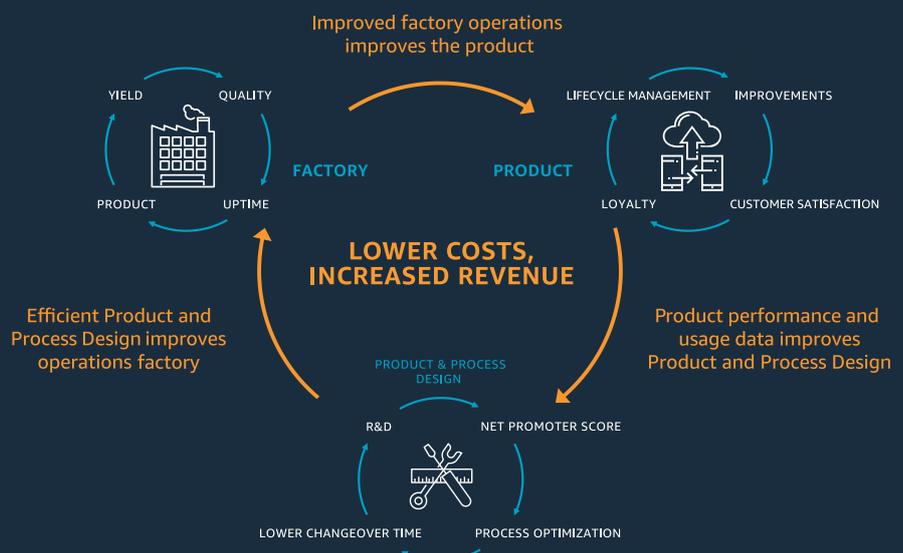
Source: Aberdeen

FACTORY DATA IN

1 Ingest > 2 Store 3 Analyze > 4 Consume

PRODUCTION INSIGHTS OUT
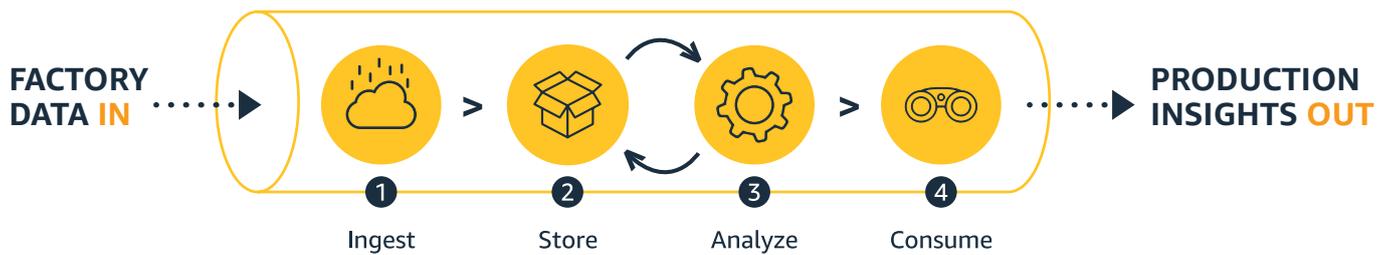
▶ The virtuous data cycle for Smart Factory

Data is a key enabler for a Smart Factory.

Data from design teams, the factory floor, and finished product behavior in the field can help optimize operations, improve the quality and usability of products sent to customer, and provide feedback to design and engineering team's to create better products. This data from each segment creates a positive flywheel effect driving smart factory transformation with lower costs and increased revenue.

Improved factory operations improves the product

YIELD   QUALITY

FACTORY

PRODUCT

LIFECYCLE MANAGEMENT   IMPROVEMENTS

PRODUCT   UPTIME

LOYALTY   CUSTOMER SATISFACTION

LOWER COSTS, INCREASED REVENUE

Efficient Product and Process Design improves operations factory

Product performance and usage data improves Product and Process Design

PRODUCT & PROCESS DESIGN

R&D   NET PROMOTER SCORE

LOWER CHANGEOVER TIME   PROCESS OPTIMIZATION

▶ The manufacturing service bus describes a framework for manufacturers to leverage AWS services to enable their smart factory.

The manufacturing service bus has three distinct levels starting with the Factory Edge and extending the Ingest level into factory on-premises equipment to provide tight integration with factory operations technology systems through Factory Edge capabilities.
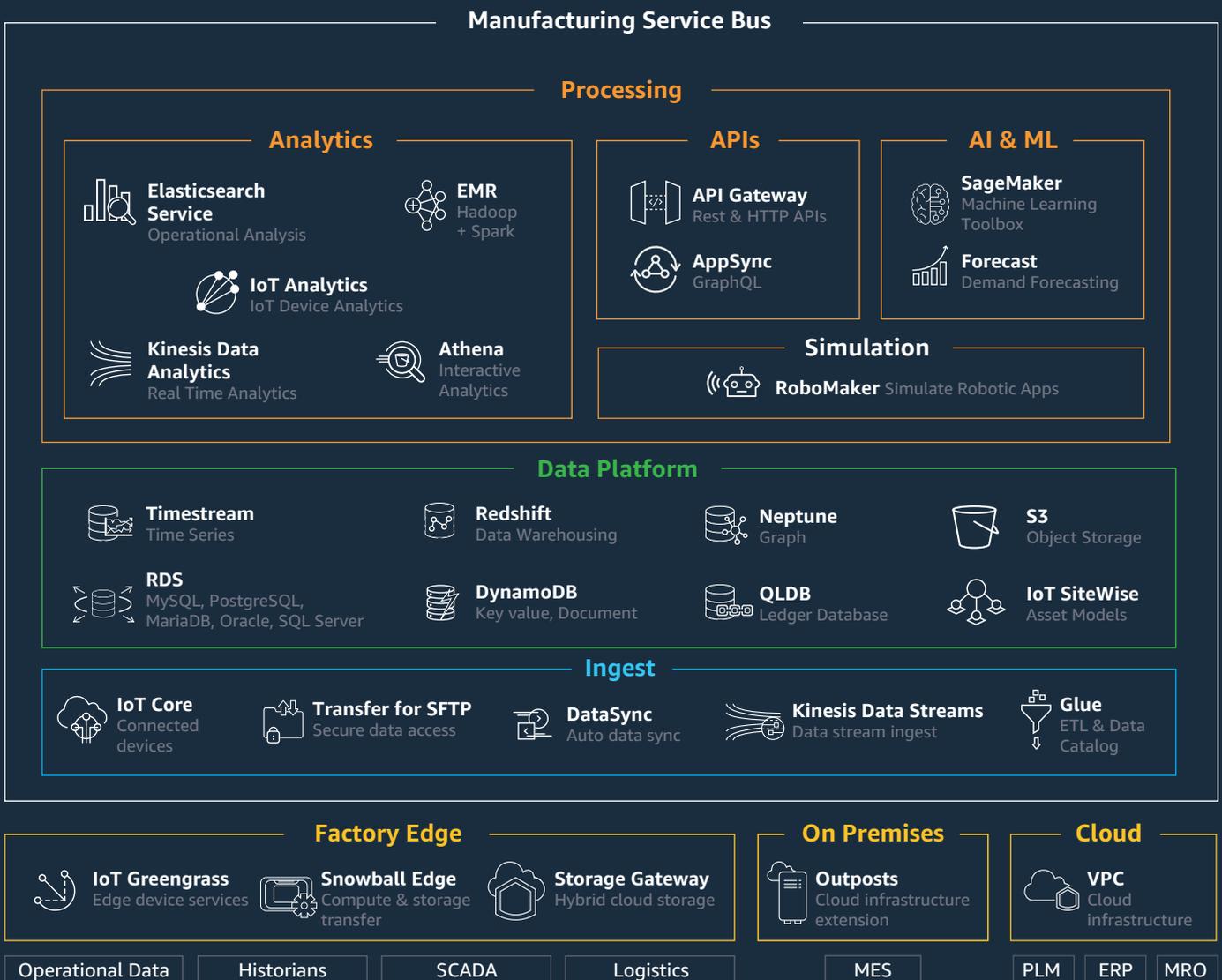
The *Ingest* level provides services to extract a variety of manufacturing data types into the *Data Platform*, for example, streaming IoT telemetry and uploading batch files from factory machines, Production Orders from ERP system or Bill of Materials exports from a PLM system.

The *Data Platform* level provides a data lake of storage services to store time series and structured data through to unstructured object data. This level also provides catalogs

of metadata data for the *Processing* level and storage of the contextualized data. This would be used for example in asset models and data relationship graphs.

The top *Processing* level consists of four service blocks for integration into the applications which consume data. Analytics services process, analyze and query the data within the *Data Platform*. API and GraphQL endpoints provide for application integration into the manufacturing service bus.

Machine learning services run prediction algorithms and forecasting on the data within the *Data Platform* via batch processing or as a REST API for the consuming applications. Lastly, Robomaker allows for the simulation and deployment of robotic applications at cloud scale.

Manufacturing Service Bus

Processing

Analytics

Elasticsearch Service
Operational Analysis

EMR
Hadoop + Spark

IoT Analytics
IoT Device Analytics

Kinesis Data Analytics
Real Time Analytics

Athena
Interactive Analytics

APIs

API Gateway
Rest & HTTP APIs

AppSync
GraphQL

AI & ML

SageMaker
Machine Learning Toolbox

Forecast
Demand Forecasting

Simulation

RoboMaker Simulate Robotic Apps

Data Platform

Timestream
Time Series

Redshift
Data Warehousing

Neptune
Graph

S3
Object Storage

RDS
MySQL, PostgreSQL, MariaDB, Oracle, SQL Server

DynamoDB
Key value, Document

QLDB
Ledger Database

IoT SiteWise
Asset Models

Ingest

IoT Core
Connected devices

Transfer for SFTP
Secure data access

DataSync
Auto data sync

Kinesis Data Streams
Data stream ingest

Glue
ETL & Data Catalog

Factory Edge

IoT Greengrass
Edge device services

Snowball Edge
Compute & storage transfer

Storage Gateway
Hybrid cloud storage

On Premises

Outposts
Cloud infrastructure extension

Cloud

VPC
Cloud infrastructure

| Operational Data | Historians | SCADA | Logistics | | MES | | PLM | ERP | MRO |

▶ **AWS and our extensive network of APN partners allow you to focus your resources on optimizing production, creating new smart-product business opportunities, and improving operational efficiencies across the value chain, not on the infrastructure to make it happen.**

SIEMENS   accenture   GE   Seeq   infor   OSIsoft.   ABB   Deloitte.

"
"By reducing paper tears, we have increased profits by millions of dollars for one production line."

- Steve Bakalar
VP of IT/Digital Transformation
Georgia Pacific

GP **Georgia-Pacific**
"

"
"I see a lot of speed of innovation coming from AWS, and we are confident this is the platform we are going forward with."

- Johan Tommervik,
CIO SKF

SKF
"

"
"Through our optimization and right-sizing efforts, migrating our data centers to AWS is saving us more than $2 million a year."

- Tanner Gonzalez
Analytics Leader INVISTA

INVISTA
"

Get started with AWS

Leading manufacturers are already using AWS. Contact AWS and start your own AWS Cloud journey today to improve agility, optimize business operations, and lower costs.

Contact sales