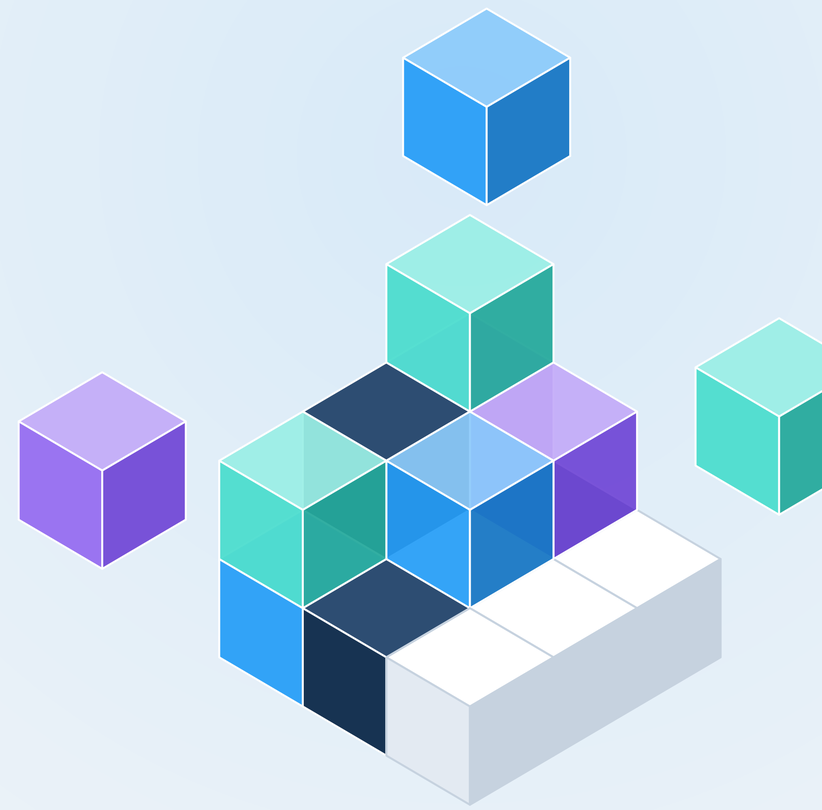
DIGITAL OPERATIONS

Industry 4.0 Reference Architecture

An Industry 4.0 reference architecture stacks the layers needed to turn machine signals into better decisions: assets, connectivity, data, analytics and the decisions themselves.



01 THE CORE MODEL

STACKED LAYERS · FROM ASSET TO DECISION

LAYER 5	**Decisions**	People and automated actions
LAYER 4	**Analytics**	Dashboards, models, AI
LAYER 3	**Data**	Platform, storage, context
LAYER 2	**Connectivity**	Networks and protocols, such as OPC UA and MQTT
LAYER 1	**Assets**	Machines, sensors, products

DATA

ACTIONS

Assets

Machines, sensors and products that create the raw signals.

Data platform

Collects, stores and adds context such as order, part and shift.

Analytics to decisions

Turns data into insight and, where safe, into automatic action.

02 BUILDING THE STACK

Start from a decision to improve, then build the layers it needs.

TECH FIRST — USE CASE FIRST

TECHNOLOGY-LED

- − Sensors everywhere, data unused
- − Pilots that never scale
- − Platforms without users

USE CASE-LED

- + A clear decision to improve
- + Only the data that decision needs
- + Proven use cases scaled on one platform

03 WORKED EXAMPLE

COMPRESSED AIR LEAKS IN A PLANT · ONE USE CASE

ASSET
Flow sensors
on the main air lines

→

CONNECTIVITY
OPC UA to platform
every minute

→

ANALYTICS
Night-time baseline
flags leaks

→

DECISION
Leak repair route
weekly for maintenance

04 MANAGEMENT TAKEAWAYS

01
Start with the decision
Name who decides what, and how data will help.

02
Add context early
Machine data without order and part context has little value.

03
Plan for scale
Use standards so the second use case costs less than the first.

05 COMMON MISTAKE

LIMITATION
Pilot purgatory
Many pilots, none scaled. Choose an architecture and owners that let good pilots roll out.