

# OTC I 4.0 (Smart Factory)



COMPLETE  
METALWORKING  
SOLUTIONS

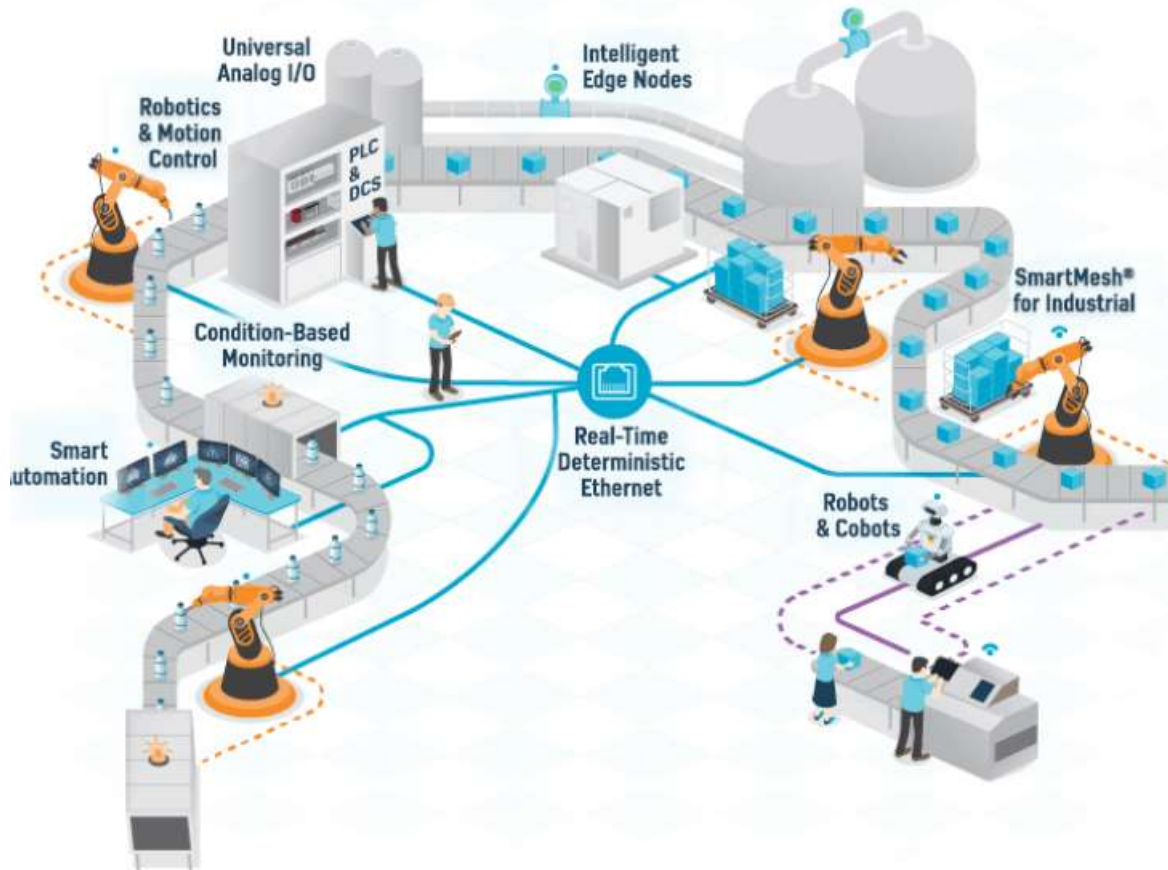
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## The next big thing in manufacturing



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# What is I 4.0 (Smart Factory)

## **4<sup>th</sup> Industrial Revolution Future**

(Big Data, M2M communication, Intelligent Automation)

## **3<sup>rd</sup> Industrial Revolution 1914-Present (Computers, Automation)**

## **2<sup>nd</sup> Industrial Revolution 1850-1914 (Electricity, Mass Production)**

## **1<sup>st</sup> Industrial Revolution 1700s (Mechanization, Water/Steam power)**



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# I 4.0 (Smart Factory) Philosophy

## Lights out manufacturing



Popular in Asian and European auto manufacturing

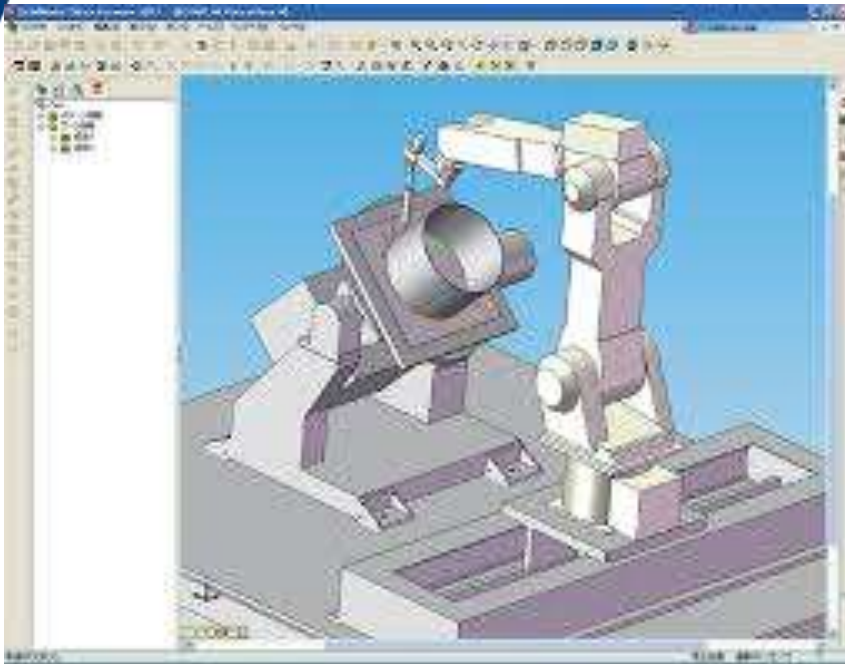


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# Nine Pillars of I 4.0

## 1. Virtual Reality



**OFFLINE PROGRAMMING**



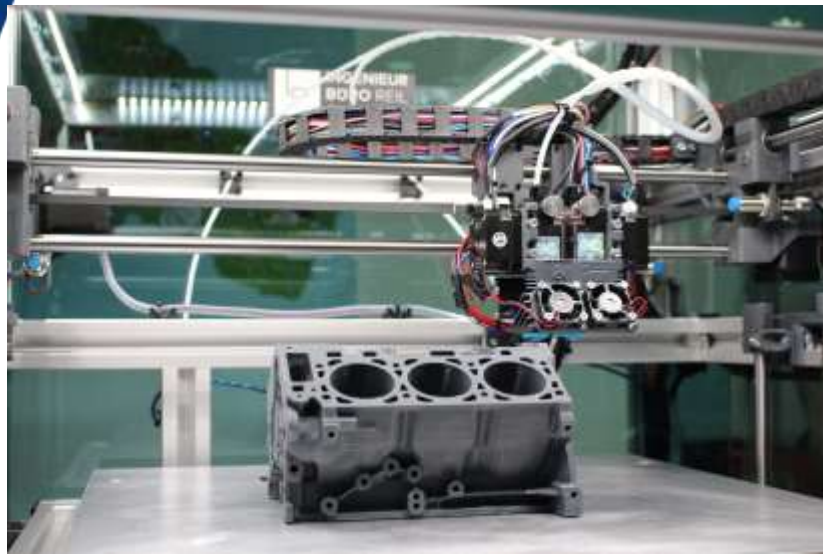
**Design without physical prototype**



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## 2. Adaptive Manufacturing

New way



3 D Printing

Old way



Machining from block of steel



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### 3. Internet Of Things IIOT

#### INDUSTRIAL INTERNET OF THINGS



[www.wildnettechnologies.com](http://www.wildnettechnologies.com)

Powered by Wildnet Technologies

**Every machine and system connected**



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## 4. BIG DATA



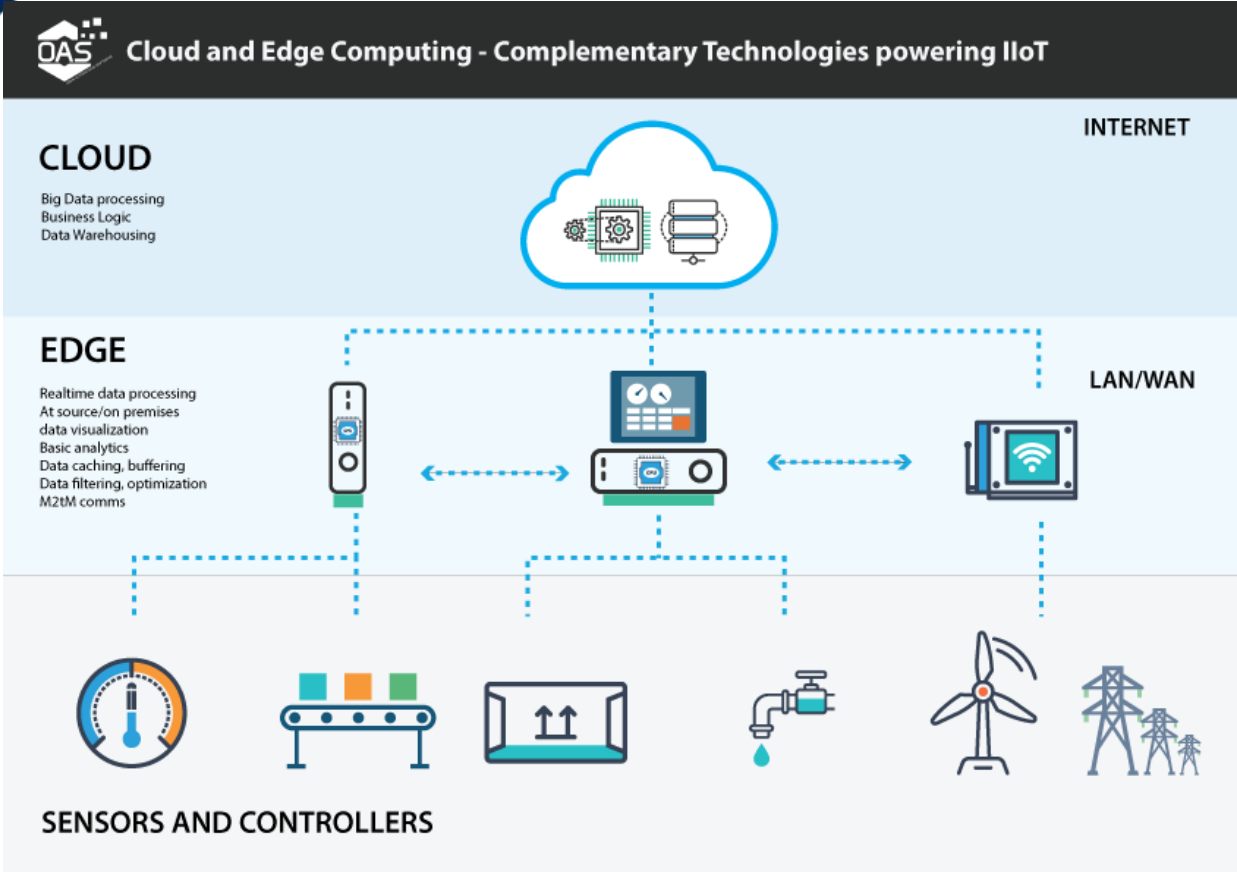
Data mining, Predictive analytics, Machine learning

# 5G



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# 5. Cloud Computing

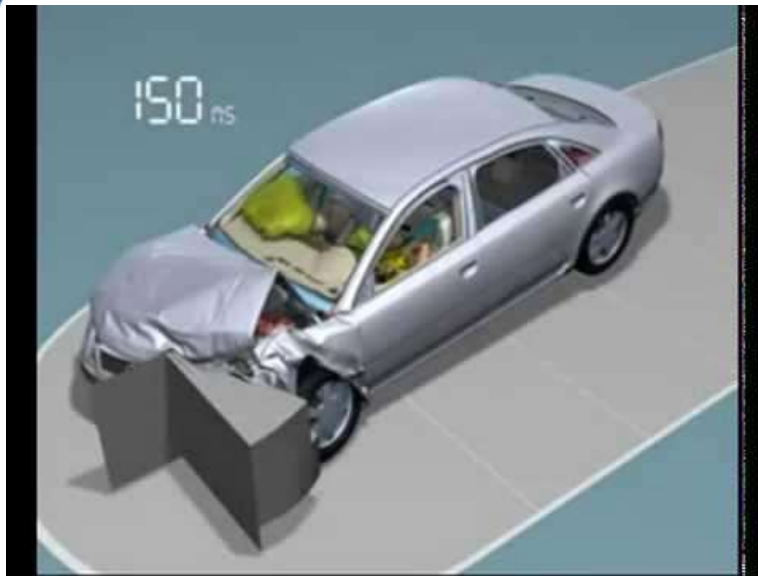


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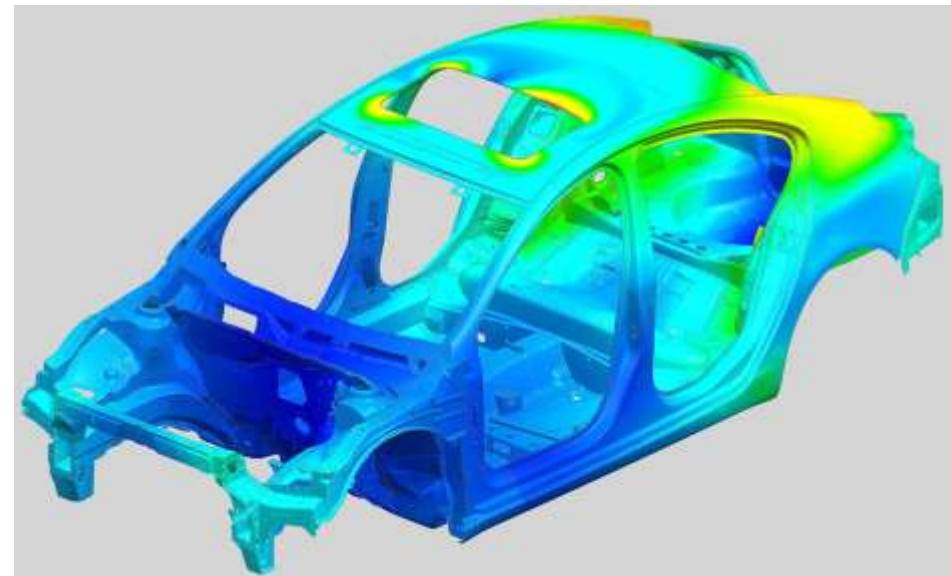
## 6. Advanced Simulations

### TESTING



**Test without destroying a car**

### DESIGN



**FEA testing  
Locate stress hot spots**



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## 7. Autonomous robots



AGVS, Cobots, Robot vision , Drones



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## 8. Universal Integration



**Tracking parts through all machines and processes**

**From order to delivery**



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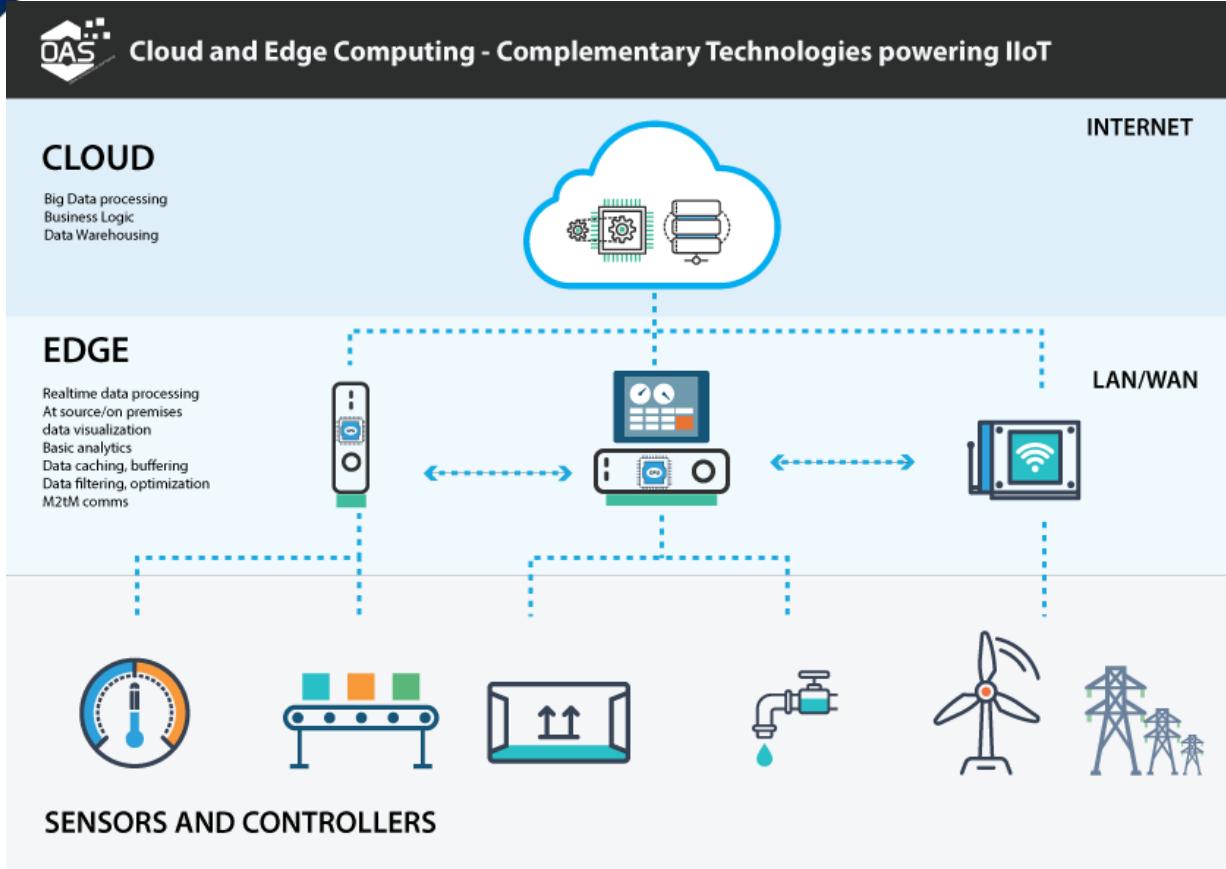


## 9. Cyber Security





# Cloud Computing vs Edge



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# Edge Computing

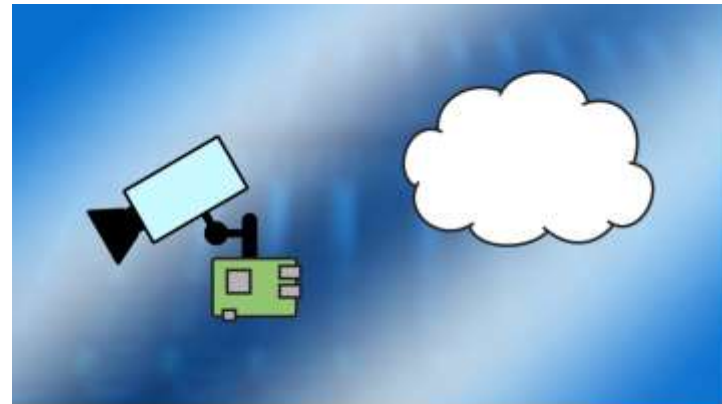
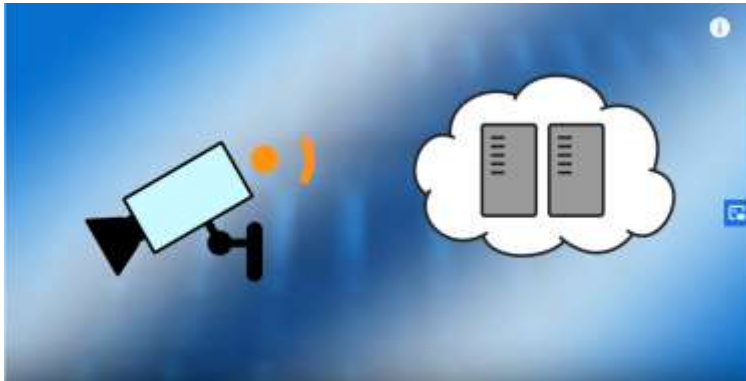
## Open Glossary of Edge Computing

The delivery of computing capabilities to the logical extremes of a network in order to improve the performance, operating cost and reliability of applications and services. By shortening the distances between devices and the cloud resources that serve them, and also reducing network hops, edge computing mitigates the latency and bandwidth constraints of today's Internet, ushering in new classes of applications.

# EDGE devices

Large amounts of data from video

Local device (EDGE) reduce cloud computing



Save on band width and remove latency

## EDGE devices with their own memory.





# Raspberry Pie



## Raspberry PI



Single board device with memory ,I/O, mouse. Key board, USB connections

**Similar products are popular for EDGE computing.**

## What does it mean for OTC?



**Thank God. Not much.**



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# Smooth information linkage with host systems

The robots required by our customers' production control systems can be easily processed. Supports advanced automation such as Industry 4.0.

## Example of internal robot information

Production control systems

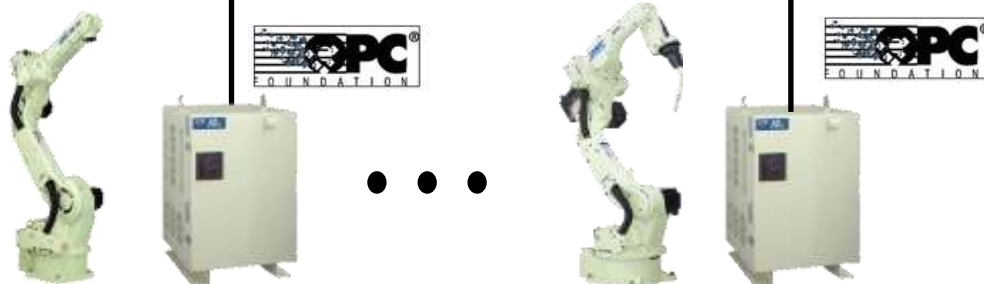


Robot's internal information

- Robot operation information
  - Robotic data (angles, speeds, motor currents, temperature, etc.)
  - Controller data (operating modes, input/output signals, variables, etc.)
- Application data
  - Construction information (construction time, work piece information, abnormality information, etc.)
  - Measured values (welding current, voltages, wire feed load, etc.)

Factory network

Customers' production facilities

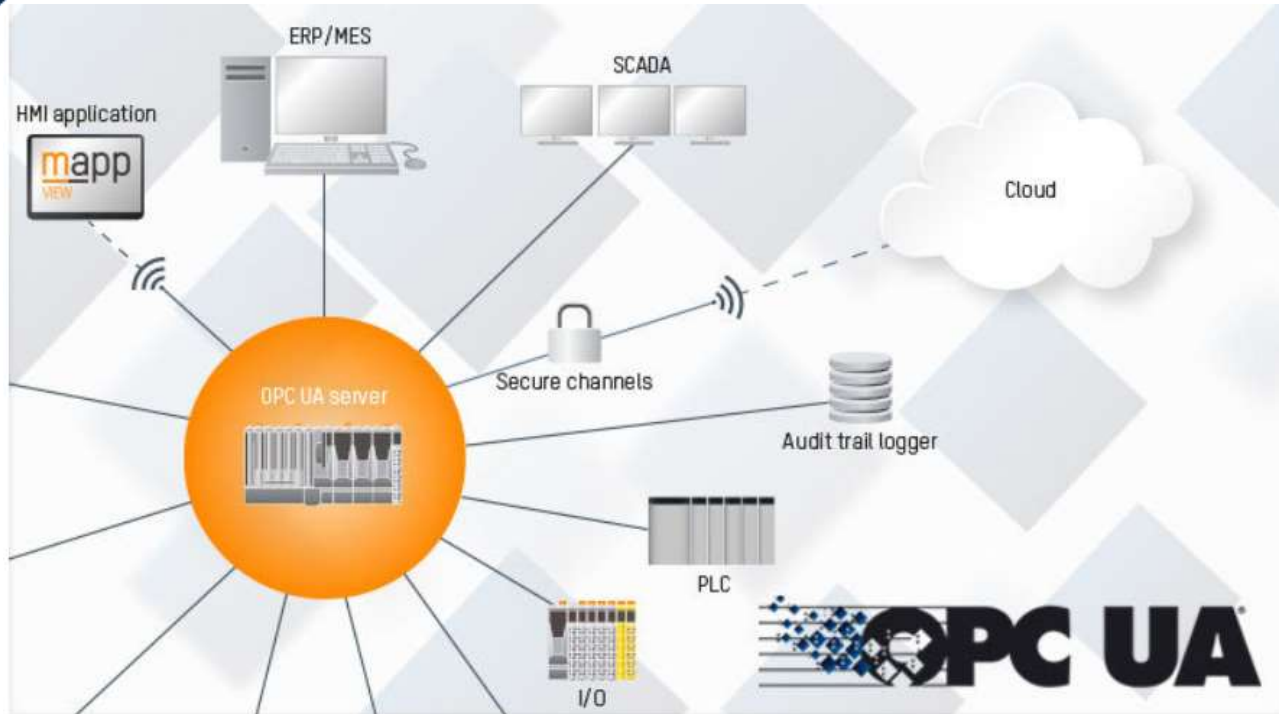


(OPC-UA response  
Software PLC built-in)

\* The internal information of the robot to be output is selected by TP.



# What Is OPC UA?



**The ideal communication protocol for Industry 4.0**



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**OPEN PLATFORM COMMUNICATION**

**UA Stands for Unified Architecture**

**A Foundation made up of mostly controls engineers to create standards.**

**Similar to AWS.**

**Industrial Standard communication protocol for packaging data from the **EDGE** (your machines) to the IOT (Internet Of Things). Not a software.**

**We pay to be OPC UA compatible**



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## OPC-UA Server & Client communications



Network route between the IP addresses of the OPC Client and the OPC Server



### OPC-UA = Totally routable

- Through Routers & Firewalls
- Between different Windows Domains
- Between OT & IT departments

i.e. suitable for all modern topologies...

- Across small LAN networks
- Across larger site-wide networks
- Across corporate wide area networks
- Between sites, across the Internet

# Robot data output chain example

## Applied: OPC UA Information Models



Physical Asset



OPC UA Information Model



IM may change dynamically as new attachments are added

Data Points



OPC UA Server For Robot



OPC UA

Matrikon® | FLEX

Matrikon® FLEX supports dynamic address space management.  
→ Thread safe for simultaneous changes:  
→ In server manipulation  
→ Via OPC UA client requests  
→ Reading in nodeset files



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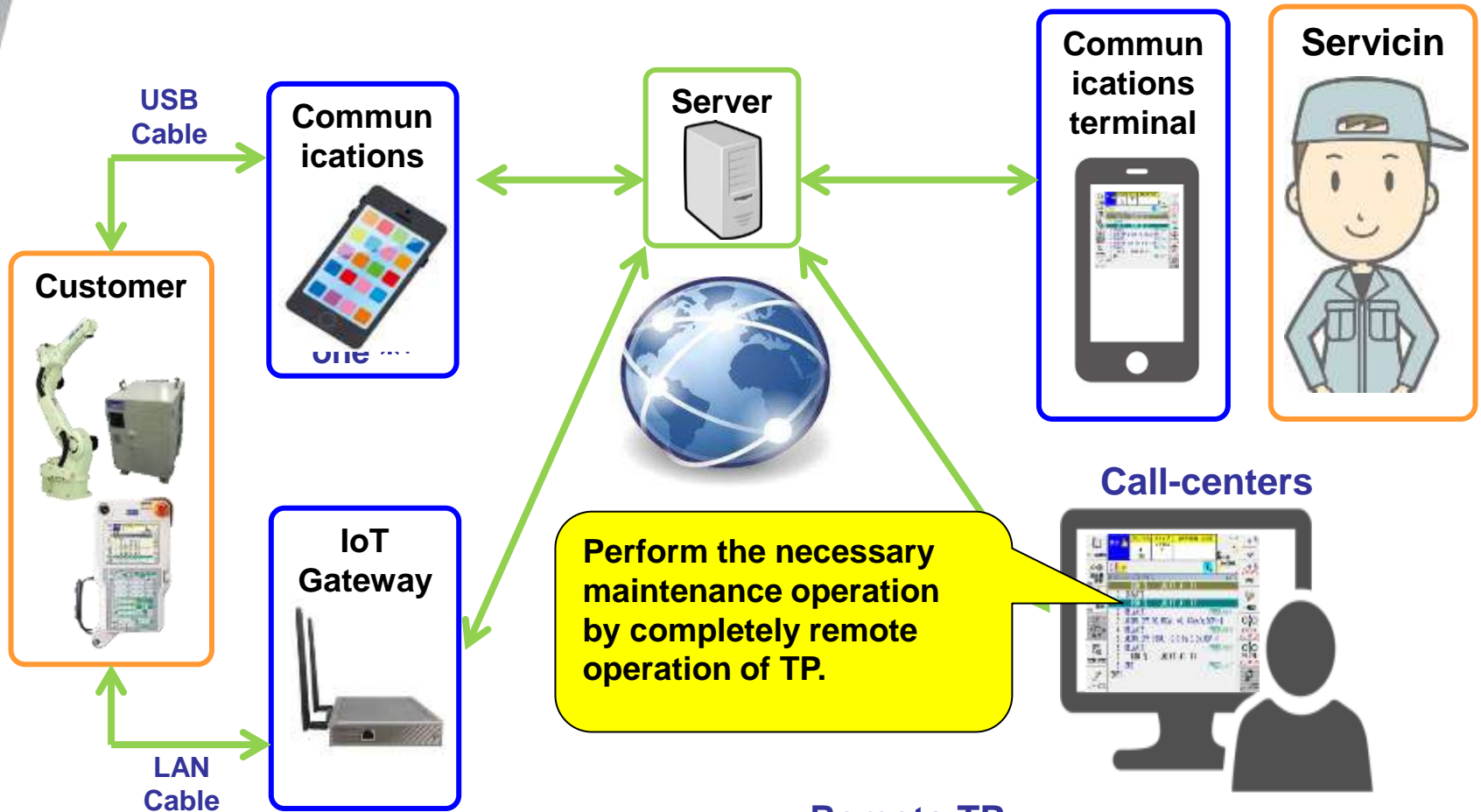
# FD 21 output data example for I4.0 system

Robot information Group1		Welding Application	
Group Number	Category Number	Item	unit
1	1	Arc ON time [Hour] (Last)	Hour
1	2	Arc ON time [Minute] (Last)	Minute
1	3	Arc ON time [Second] (Last)	Second
1	4	Arc ON time [Hour] (Previous)	Hour
1	5	Arc ON time [Hour] (Previous)	Minute
1	6	Arc ON time [Hour] (Previous)	Second
1	7	Weld Ratio (Last)	%
1	8	Weld Ratio (Previous)	%
1	9~12	Welder1~4 Setting value of Weld currenr	A
1	13~16	Welder1~4 Setting value of Weld voltage	V
1	17~20	Welder1~4 Setting value of Weld speed	cm/min
1	21~24	Welder1~4 Setting Gas flow	L/min
1	25~28	Welder1~4 Weld current (Monitor)	A
1	29~32	Welder1~4 Weld voltage (Monitor)	V
1	33~36	Welder1~4 Weld speed (Monitor)	cm/min
1	37~40	Welder1~4 Wire load factor	%
1	41~44	Welder1~4溶接機 1~4のスパッタ抑制率	%
1	45~48	Welder1~4 Motor current of Wire Feeder	A
1	49~52	Welder1~4 Wire Feed speed (Wire Feeder)	cm/min
1	53~56	Welder1~4 Gas flow	L/min
1	57~60	Welder1~4 Driving force of Gas valve	%
1	61~64	Welder1~4 Wire load factor of Tig filler	%
1	65~68	Welder1~4 Wire feed speed (monitoring unit)	cm/min
1	69~72	Welder1~4 Wire feed speed of Tig filler (Monitoring unit)	cm/min
1	73~76	Welder1~4 Primary input voltage	V
1	77~80	Welder1~4 Temperature of Control board	°C
1	81~84	Welder1~4 Temperatur of Main curcuit	°C
1	85~88	Welder1~4 Frequency of cooling FAN1	rpm



# Remote maintenance

Connect the robot controller to the service center via the network in case of trouble. Rapid support is available.



\*1 Only Android terminal is supported.

- Remote TP
- Remote backup
- Remote upgrade

**The good news is we  
only need to speak the  
I4.0 language. The rest  
is up to IT departments.**



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# The Bad News is.



## ZERO DOWN TIME

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ZDT is an IOT application for FANUC products

**FANUC CORPORATION**

**Our competition is about 3 years ahead**

**Miller , Lincoln , Fronius**



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# NEW Words

I 4.0 (Smart factory)

IIOT Ind. Internet of Things

Edge Computing

Raspberry PI

OPC UA



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Thank you.

Questions???



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