



Industry 4.0
le nuove prospettive dell'automazione industriale

Claudio G. Asnaghi
Senior Consultant
Industrie 4.0 Project Leader

Industrie 4.0

Le nuove prospettive per l'automazione industriale

Festo 4.0 per la Smart Factory

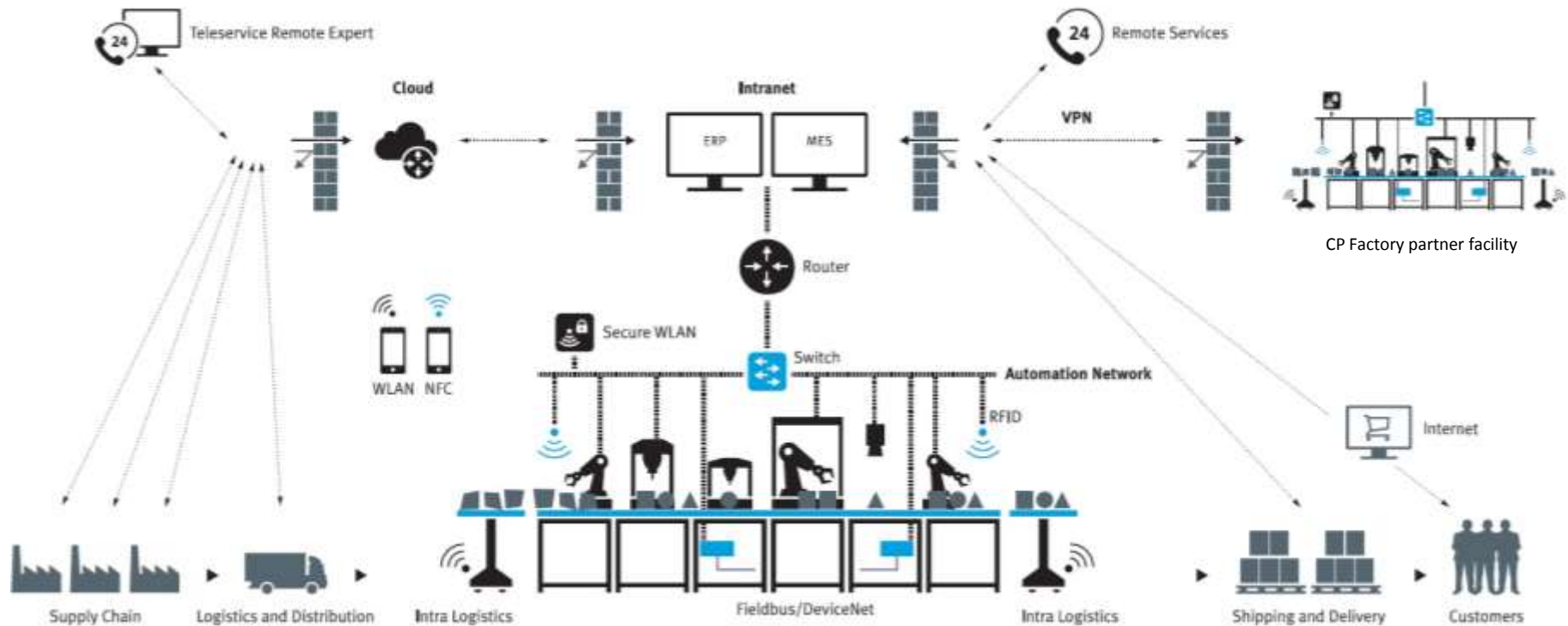
Dove troviamo l'ispirazione

Festo Technology Plant

- Modularità in produzione
- Infrastruttura Control e IT
- Mobile Maintenance

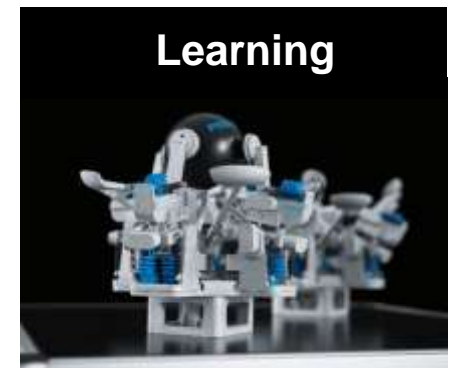
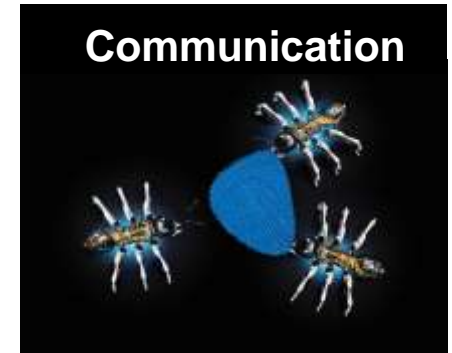
La fabbrica del futuro

Sistemi di produzione per una fabbrica interconnessa, adattiva, flessibile



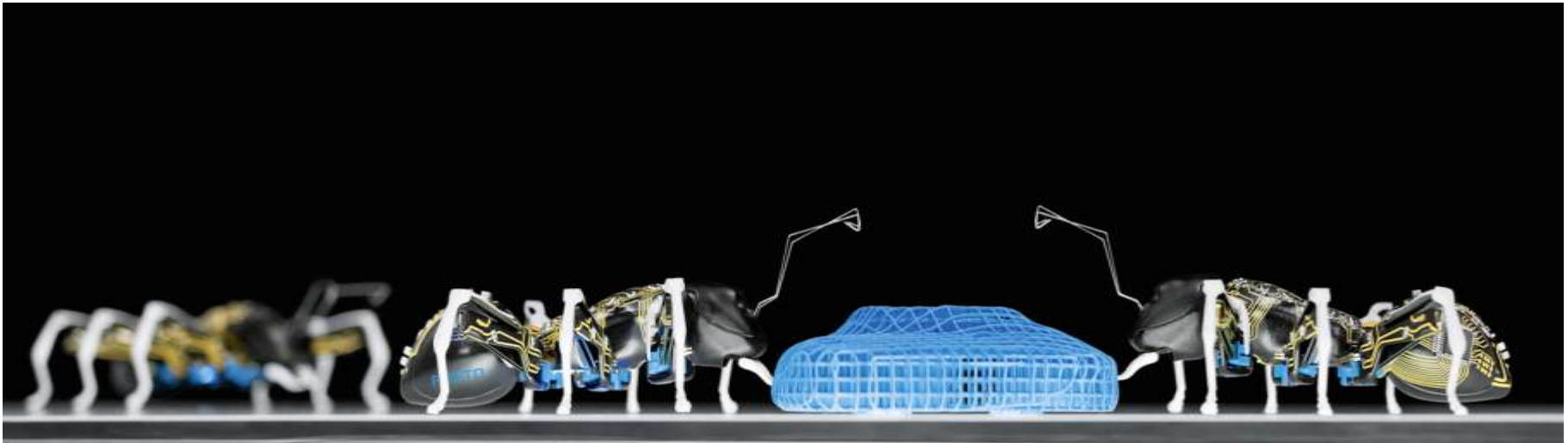
Ispirazione per automazione di fabbrica e di processo

Imparare dalla natura per la produzione del futuro



Sistemi autonomi integrati per l'esecuzione di operazioni complesse

BionicANTs



- Algoritmi di controllo per la cooperazione tra sistemi indipendenti all'interno di un network
- Microsistemi altamente tecnologici
- Sistemi multi-agent con intelligenza distribuite
- Comunicazione Wireless, sistemi di visione e floor sensor

Sistemi di manipolazione adattivi e flessibili

OctopusGripper e BionicMotionRobot



- Tecnologia di movimento e presa completamente pneumatica
- Comando tramite Motion Terminal VTEM
- Movimenti e presa flessibili e adattivi

FESTO

Scharnhausen Technology Plant | Obiettivi



Competitività Globale



Riferimento per produzione valvole, unità di valvole, elettronica



Automazione intelligente con prodotti Festo



Collaborazione on-site dei reparti (Eng – Prod – IT)



Lean production / management



Efficienza energetica



Qualificazione personale/ learning factory

Rendiamo sostenibile il futuro: Smart Factory 4.0

**Automatizzato e
flessibile**

**Flusso produttivo
flessibile**

**Ottimizzazione
energetica**

**Learning “taken
for granted!”**



Riduzione costi, lotto
adeguato alla domanda



Flusso di info e materiali
continuamente ottimizzato



Edifici in Energy Network e
efficienza in produzione



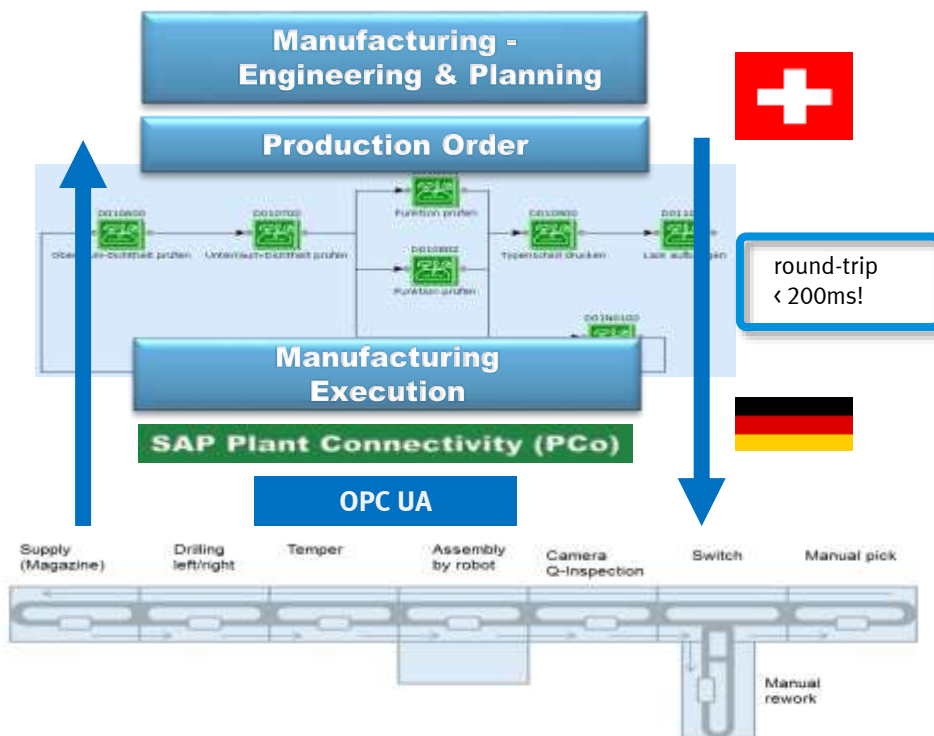
Continuo training on the job
e Learning centre in loco

Macchina modulare e intelligenza decentralizzata



- Lotto economico da 10 a 10.000 Pz
- Produzione ottimizzata sulla domanda
- Flusso materiali ottimizzato
- Comando decentralizzato
- Interfacce standardizzate
- Produzione mix prodotto

Full Process Control by SAP ME Direttamente da ERP ai PLC



Workflow:

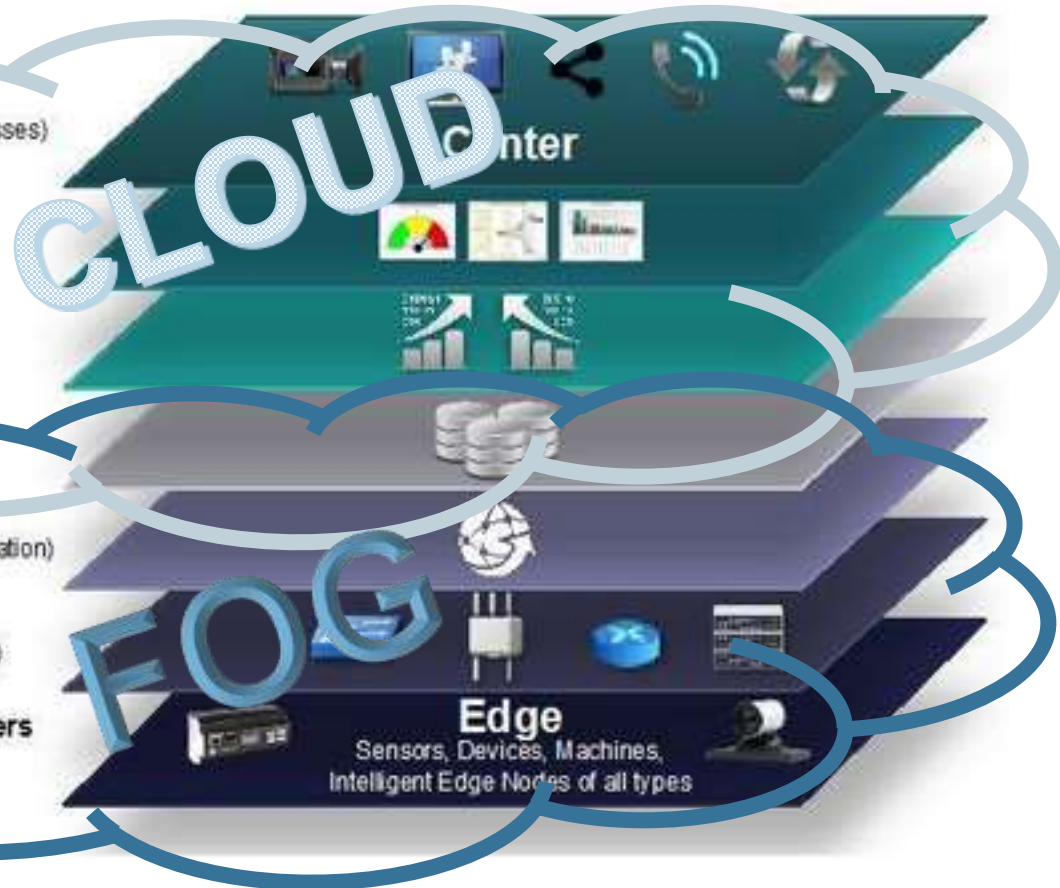
- 1) Dati rilevanti in ERP e SAP ME:
 - ▶ Routing,
 - ▶ Parametri PLC,
 - ▶ QM set points
- 2) Logistica integrata – Approvvigionamento materiali grezzi
- 3) Esecuzioni delle lavorazioni – Misure direttamente in SAP ME
- 4) Controllo qualità direttamente da SAP ME
- 5) Il flusso operative macchina è basato sul risultato delle verifiche in SAP ME (es. Scartare il componente, dare il comando “next operation”...)
- 6) Il materiale si sposta per l’operazione seguente, richiesta parametri del PLC ...

Cloud e Fog Computing

Internet of Things Reference Model

Levels

- 7 **Collaboration & Processes**
(Involving People & Business Processes)
- 6 **Application**
(Reporting, Analytics, Control)
- 5 **Data Abstraction**
(Aggregation & Access)
- 4 **Data Accumulation**
(Storage)
- 3 **Edge Computing**
(Data Element Analysis & Transformation)
- 2 **Connectivity**
(Communication & Processing Units)
- 1 **Physical Devices & Controllers**
(The "Things" in IoE)



Smart Product 4.0

Il prodotto integra **intelligenza e capacità di comunicazione**



Value added services

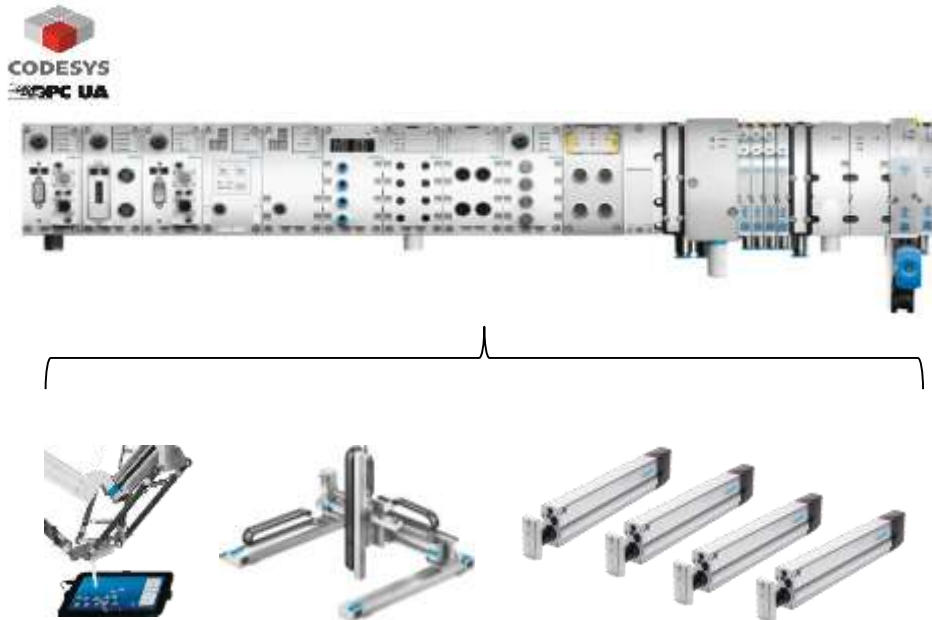
- Analysis
- Condition monitoring
- Cloud services

Business models

- Pay per user
- Predictive maintenance
- Customer support

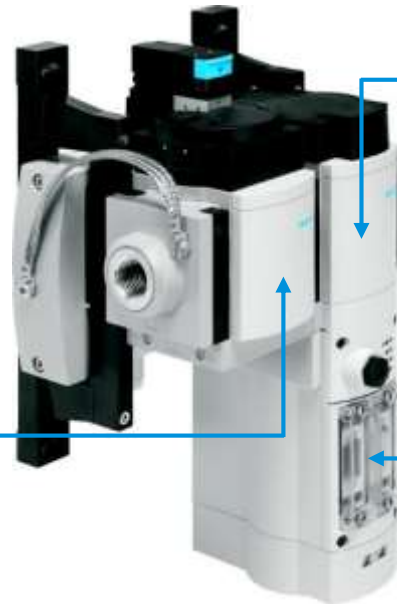
I sotto-sistemi si trasformano cyber-physical systems

Integrazione di “intelligenza” e capacità di comunicazione nei sotto-sistemi e nei moduli



Reducing energy and regulating central operating parameters

Energy efficiency module



Flow sensor and pressure sensor for process monitoring

2/2-way shut-off valve permits auto-stop function

Fieldbus nodes with fieldbus interface for online data transmission

- No wastage of compressed air during downtime
- Automatic leak detection
- Online process monitoring, remote maintenance and parameters regulation via PROFIBUS*

* PROFINET, EtherNet/IP, Codesys and OPC-UA on request)

E2M – Cos'è



**Flow
Sensor**



**Pressure
Sensor**



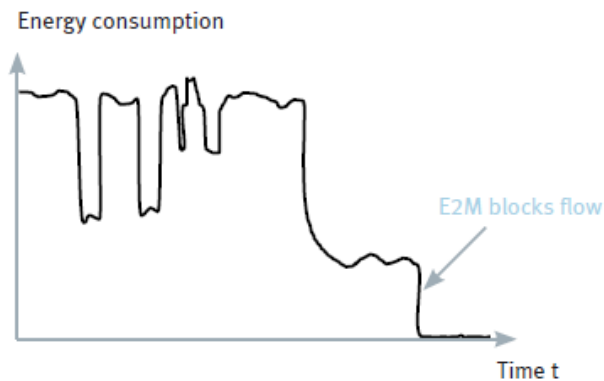
2/2 Valve



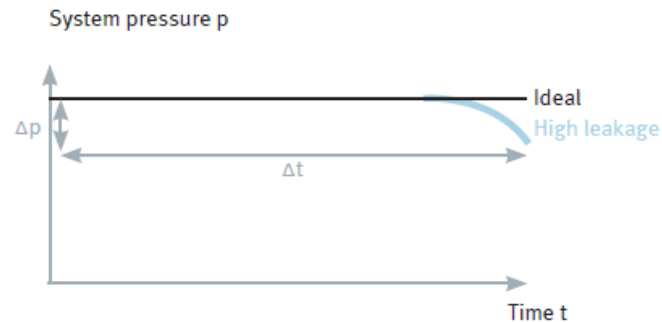
Fieldbus



E2M – Come funziona

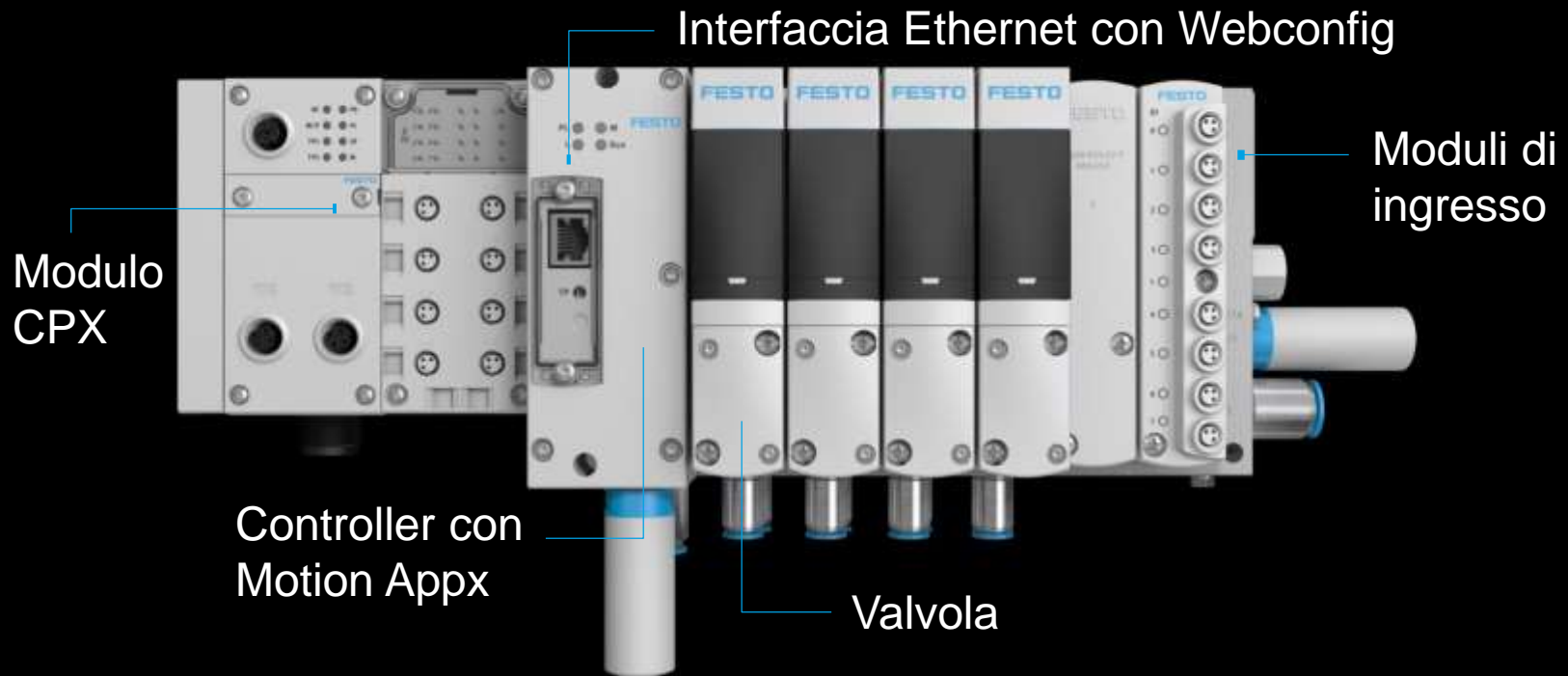


**Stop flusso aria quando
la macchina non lavora**



Controllo delle perdite

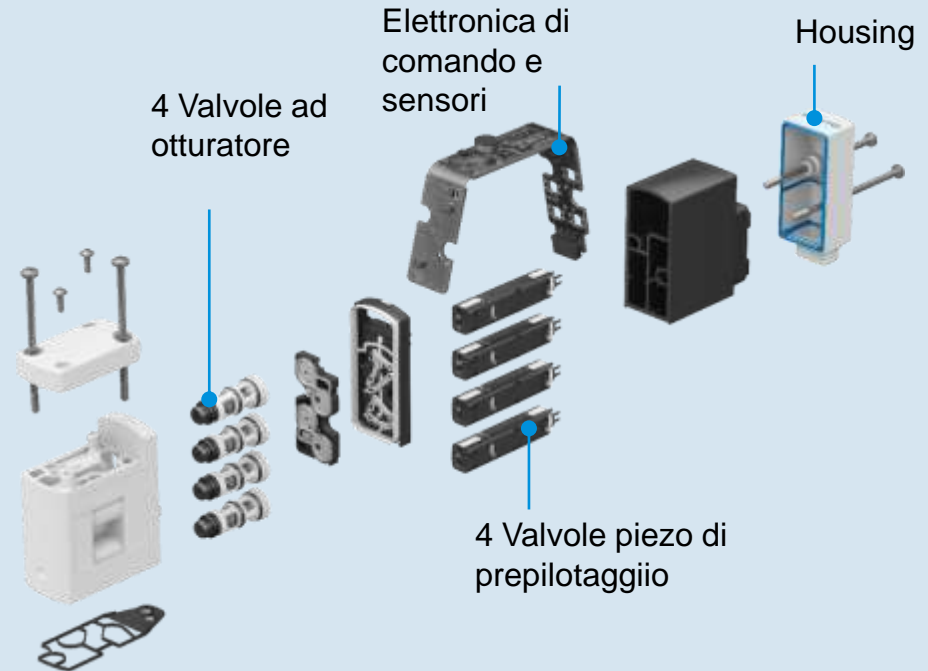
Un nuovo livello di flessibilità: un solo Hardware per tutte le funzioni



Valve technology with various functions

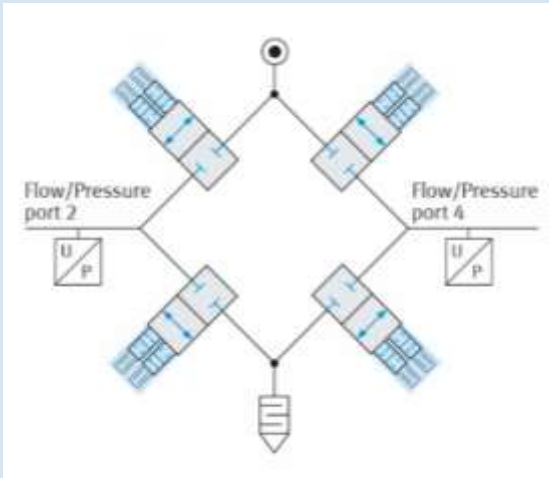
The smart valve:

Enables a variety of functions for which more than 50 components are required until now.

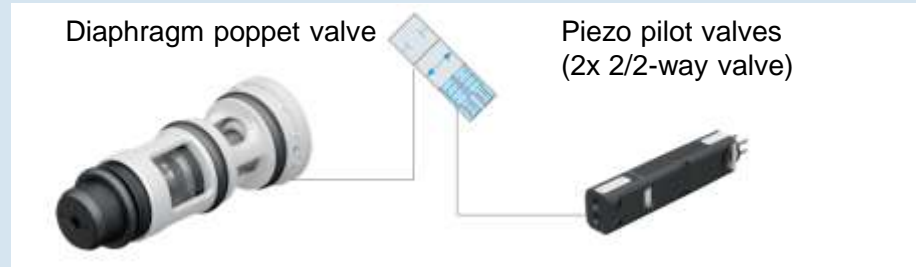


The operating principle of the new technology

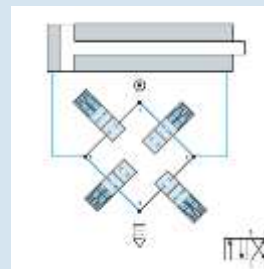
Bridge circuit with four 2/2-way valves in the form of piezo pilot valves and membrane poppet valves with integrated sensors.



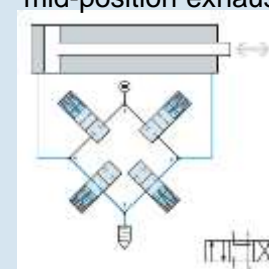
Examples for well-known valve logics:



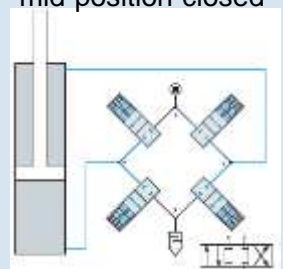
4/2-way valve



4/3-way valve mid-position exhausted



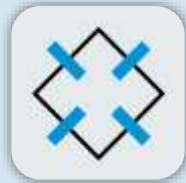
4/3-way valve mid-position closed



Standardizzazione e Flessibilità unite nelle Motion Apps

Flexibility, reduced complexity, greatest possible standardisation.
50 different components and numerous functions can be combined into one valve – and tomorrow? Even more!

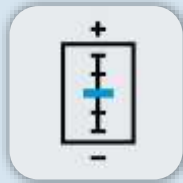
With our Motion Apps you can switch the function at the touch of a button.



Directional control valve function



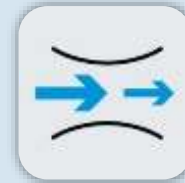
Prop. pressure regulation



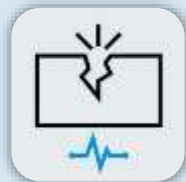
Prop. directional control valve



Model-based prop. pressure regulation



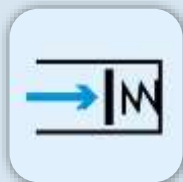
Supply and exhaust air flow control



Leakage diagnostics



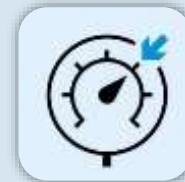
ECO drive



Soft Stop

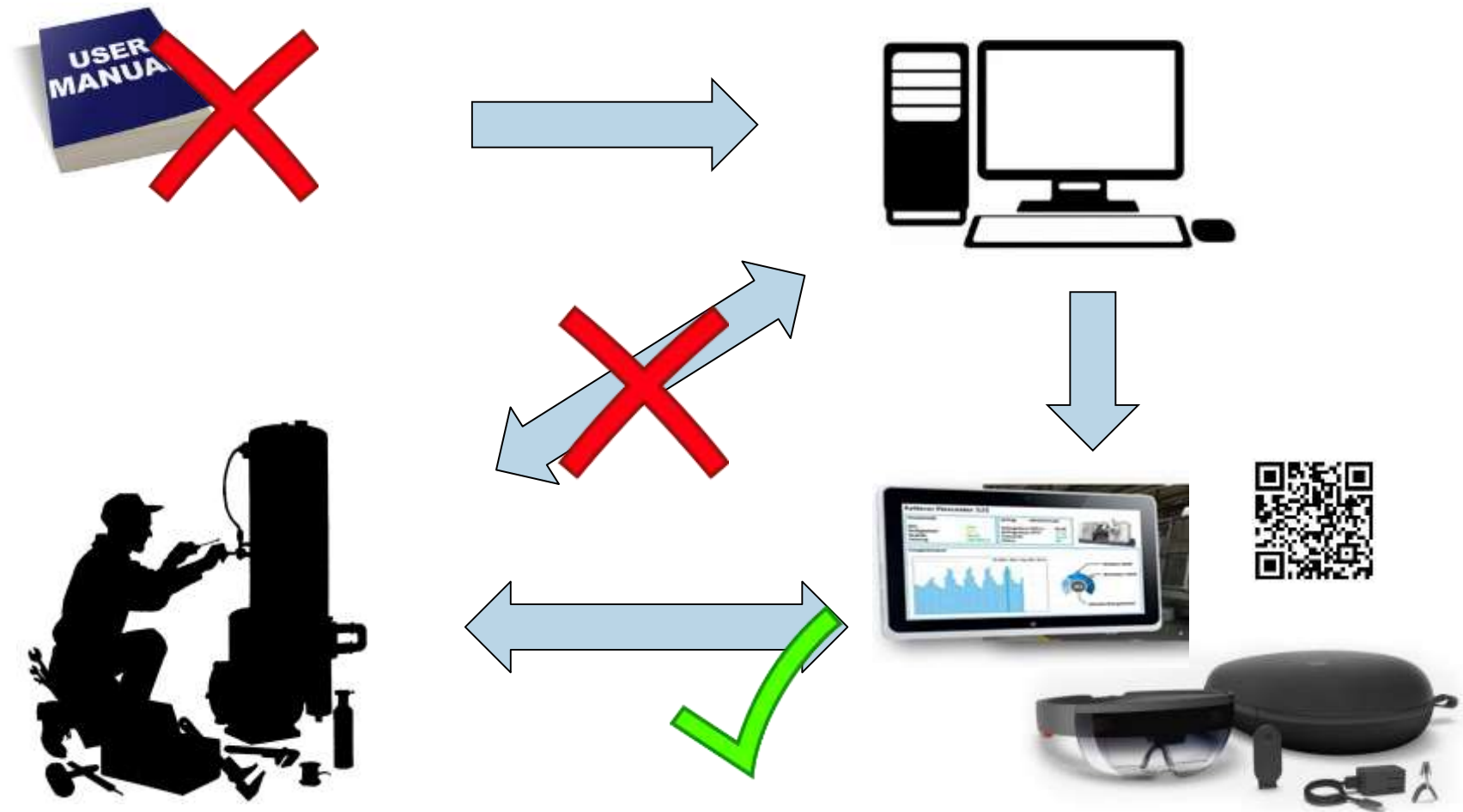


Presetting of travel time



Selectable pressure level (ECO)

Portare le informazioni sul campo



Mobile Maintenance – higher OEE and higher profitability



0 %

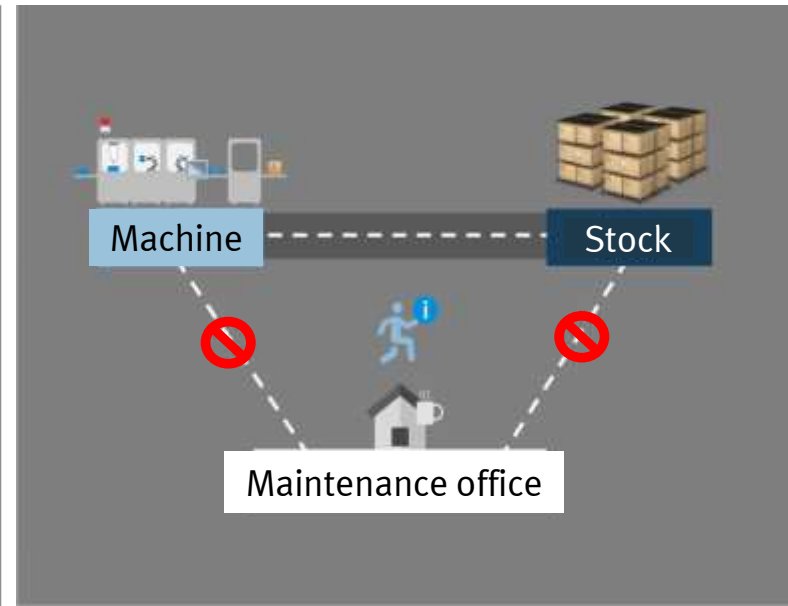
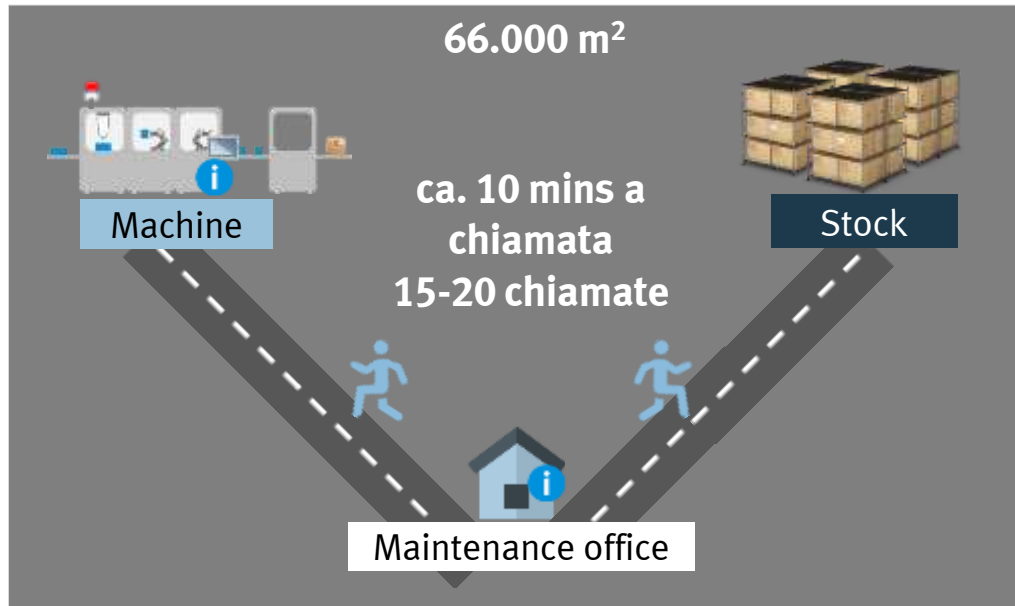
25 %

50 %

75 %

Industrie 4.0

Mobile Maintenance – higher OEE and higher profitability



WEAKNESSES

- Limited information on site
- Many places, long distance walks
- Reporting, Feedback, Status complicated at maintenance office, no work-flow

OPTIMISATIONS

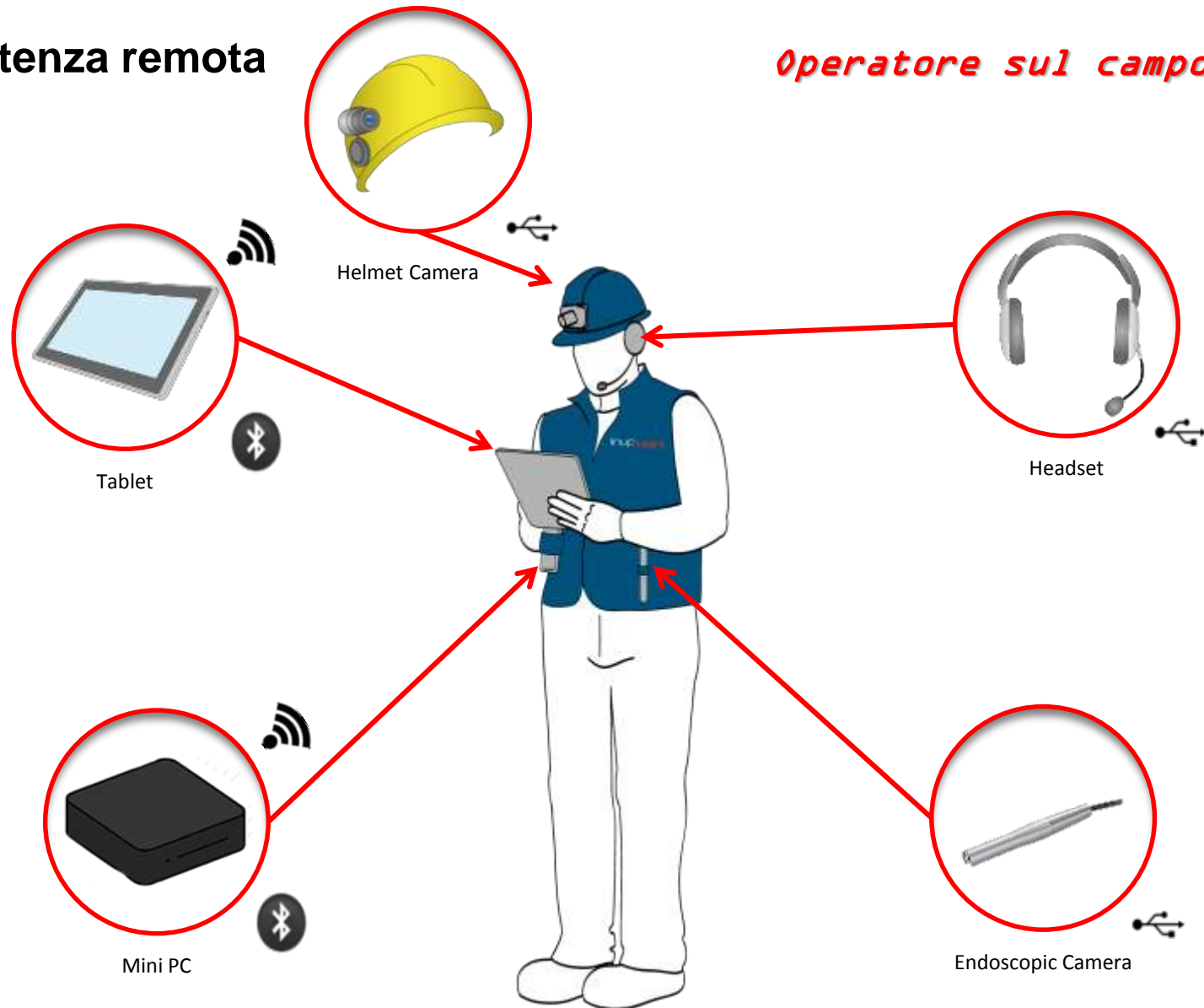
- Directe paths m-m
- Documents mobil available
- Real time information
- Time & travel savings

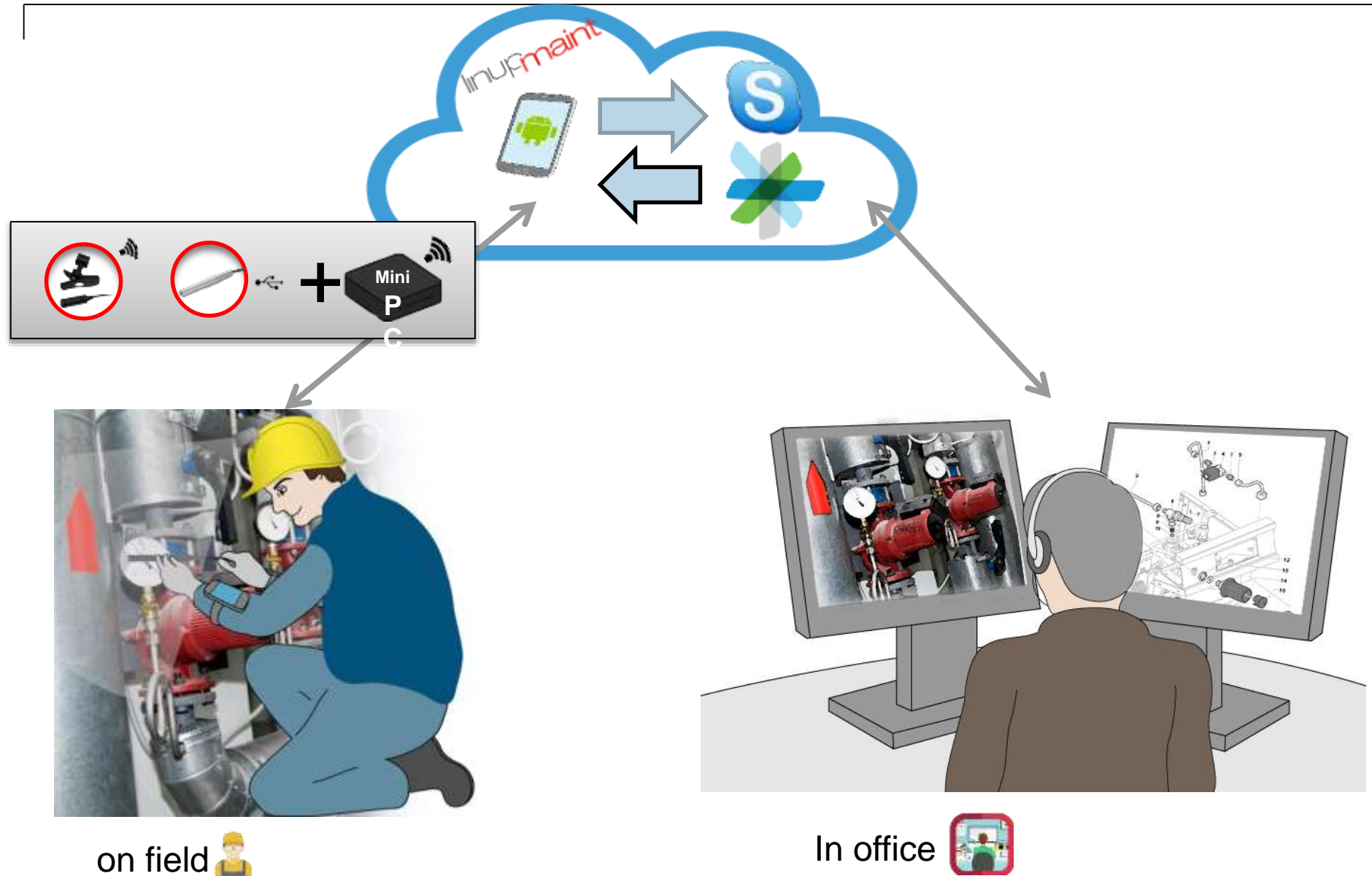
Wereable e realtà aumentata



Assistenza remota

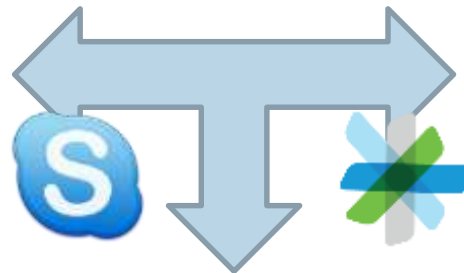
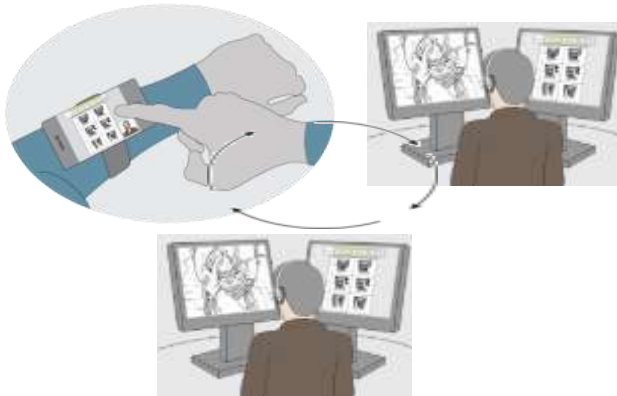
Operatore sul campo



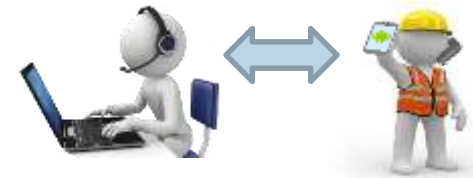


linupmaint

Video call



audio



Screen sharing

