



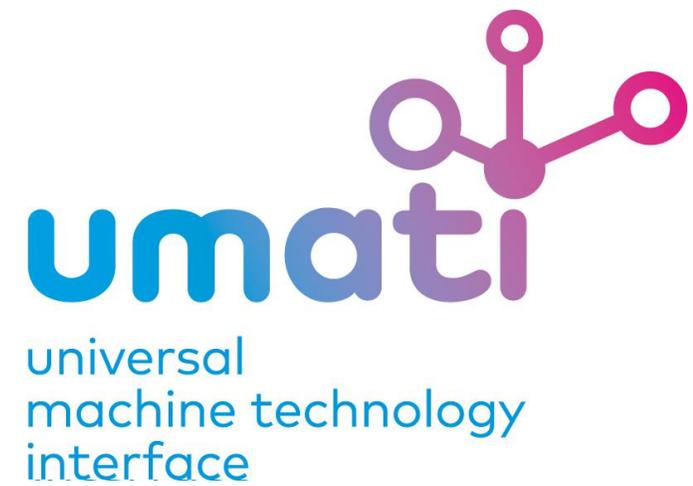
connecting the world of machinery

umati in a nutshell

Dr. Alexander Broos

2022-02-10

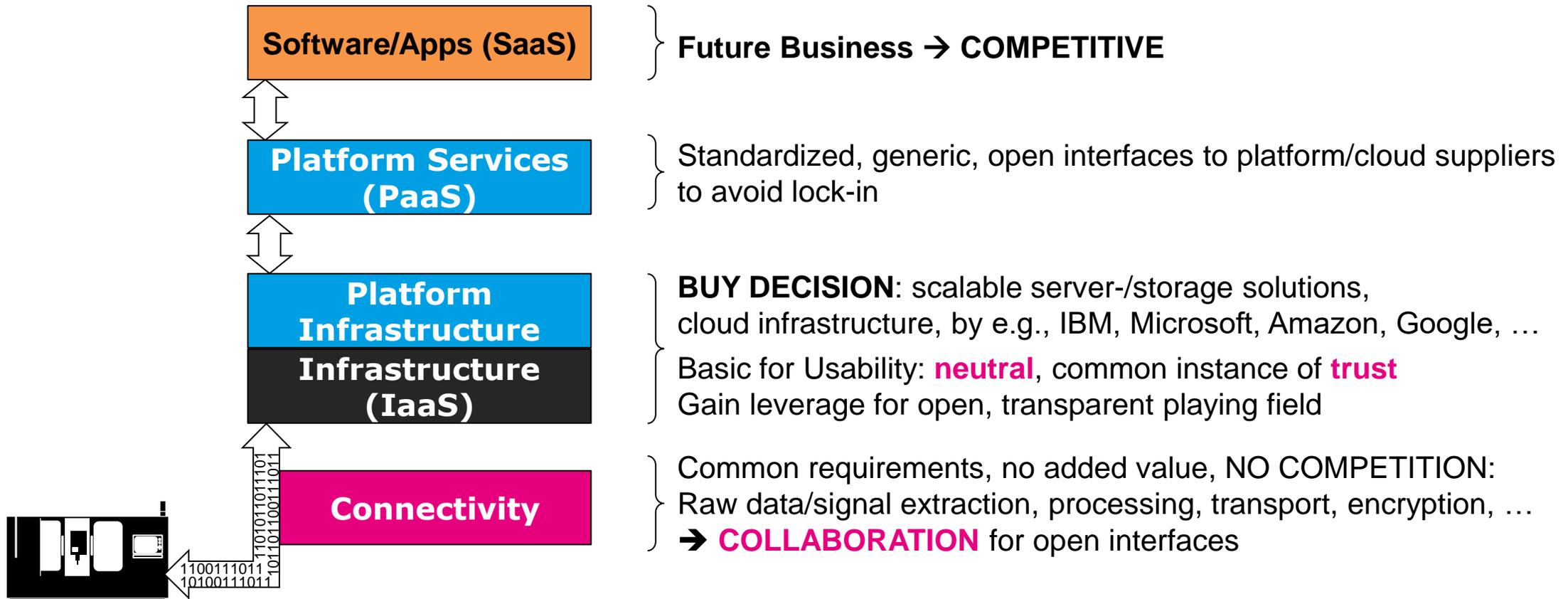
www.umati.org



umati movie

see https://www.youtube.com/watch?v=kd_lmg1stsl

Get Connected: Where to Act (Perspective of Machine Builder)



Current Situation in Manufacturing...



Machines use different interfaces

- = they „speak different languages“
- = they don't understand each other
- = integration in IT ecosystems is difficult

$$\pi \sum \sqrt{\infty} \geq 0 \leq \\ = \div \times$$



Mae g'ovannen!
Le nathlam hí



...and the solution

- > Status: operation
- > Part counter: 251
- > Remaining 179 sec

Standardization
based on

Dissemination
+ market penetration
+ community

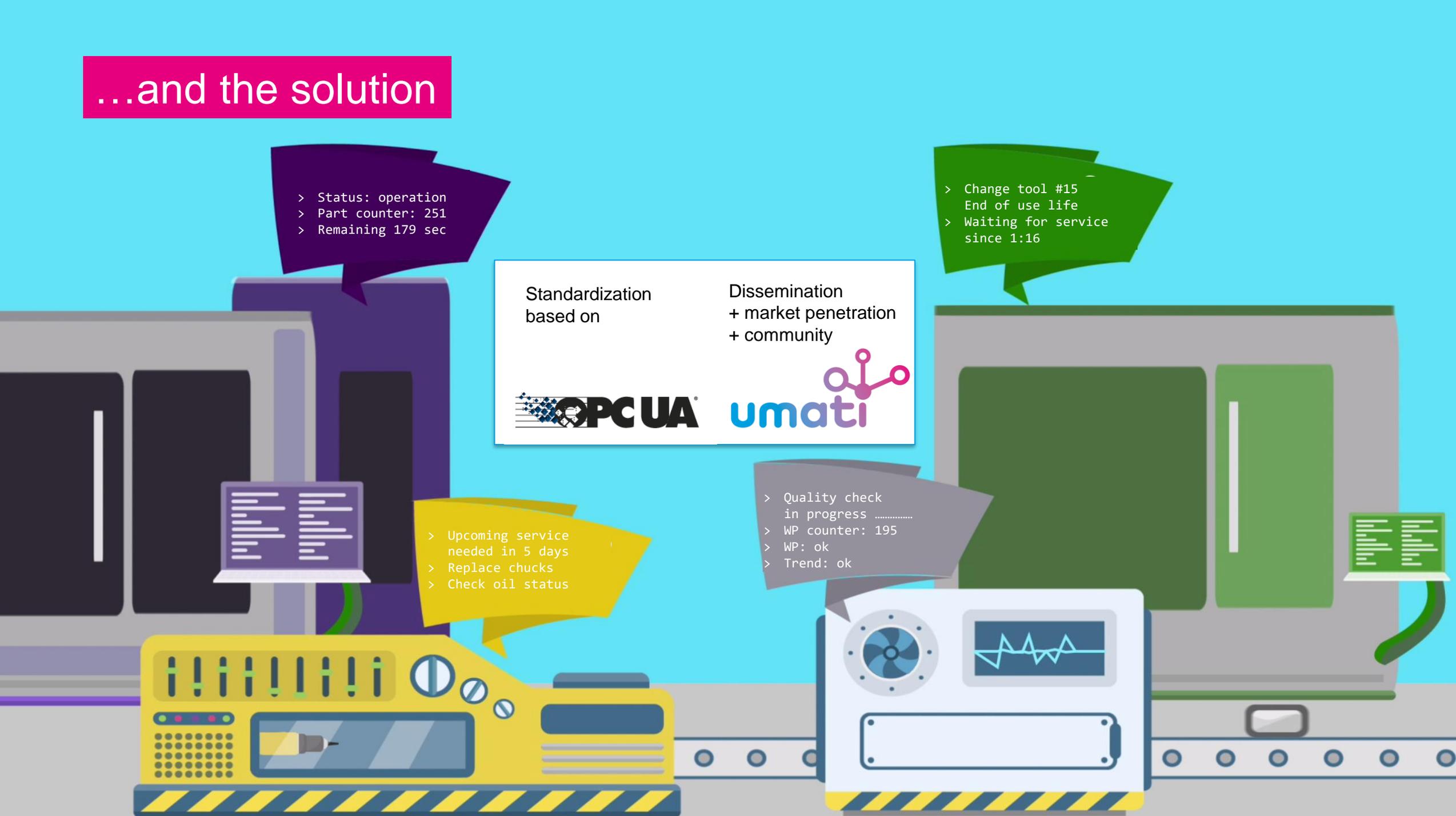
 OPCUA

 umati

- > Change tool #15
- End of use life
- > Waiting for service
since 1:16

- > Upcoming service
needed in 5 days
- > Replace chucks
- > Check oil status

- > Quality check
in progress
- > WP counter: 195
- > WP: ok
- > Trend: ok



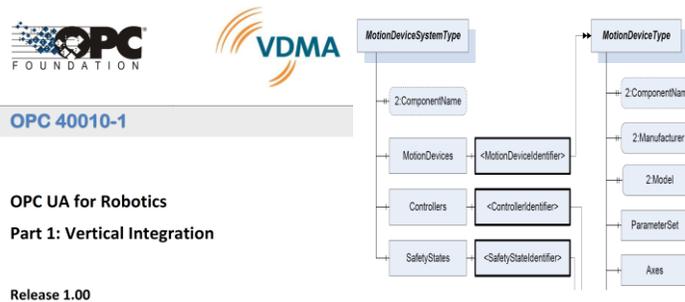
Solution (1)



Communication technology
and basic functionalities
universal with open options
→ **HOW to communicate**

„speak the same language“

Solution (1)



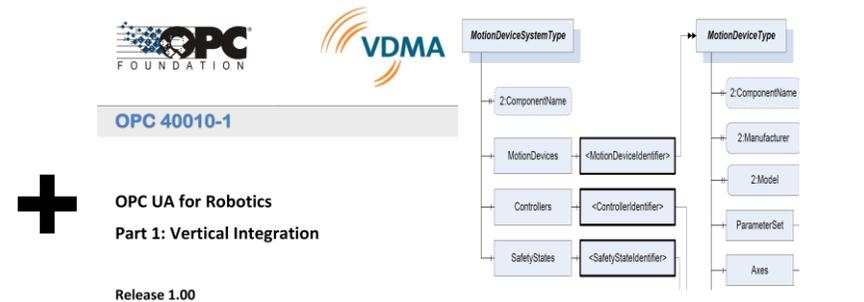
Communication technology
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universal with open options
→ **HOW** to communicate

„speak the same language“

Companion Specifications defining
contents for different applications
→ **WHAT** to communicate

„use the same dictionary“

Solution (1)



Communication technology
and basic functionalities
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→ **HOW** to communicate

„speak the same language“

Companion Specifications defining
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→ **WHAT** to communicate

„use the same dictionary“

= semantic interoperability
„understand each other“

„The Global Production
Language“ (VDMA)

Σ43!

Overview of OPC UA Working Groups at VDMA



- » Additive Manufacturing
- » Lasers and Laser Systems
- » Melting Furnace
- » Printing and Paper Technology
 - » Dryer
 - » Winding Machines
- » Surface Technology
 - » Plasma-Surface Technology
 - » Shot-Blasting Technology
- » Textile Dying and Finishing

- » Cranes and Hoists
- » Gripper
- » High Pressure Die Casting
- » Length Measurement Systems
- » M2X Intralogistics Communication
- » Mining
- » Plastics and Rubber Machinery
 - » Injection Moulding/Robots
 - » Material Supply
- » Power Transmission Engineering
- » Process Air and Filtration Systems
- » Surface Technology
 - » Material Supply
- » Textile Testing Devices

- » Compressed Air Systems DRAFT
- » Glass Industries Initiative DRAFT
- » Industrial Joining Technologies DRAFT
- » Machine Tools
- » Machine Vision
- » Plastics and Rubber Machinery
 - » General Types
 - » Extrusion
 - » LSR Dosing
 - » Hot runner
 - » Injection Moulding /MES
 - » Temperature Control
- » Pumps and Vacuum pumps DRAFT
- » Robotics
- » Weihenstephaner Standards DRAFT
- » Weighing Technology
- » Woodworking Machinery DRAFT

Harmonization – OPC UA for Machinery 1R/4D

* Development = Working Group is registered at OPC Foundation as Joint Working Group.
 ** All these groups are continuing to work on the OPC UA standards.

Harmonization – OPC UA for Machinery

Defines information model building blocks for the mechanical engineering sector



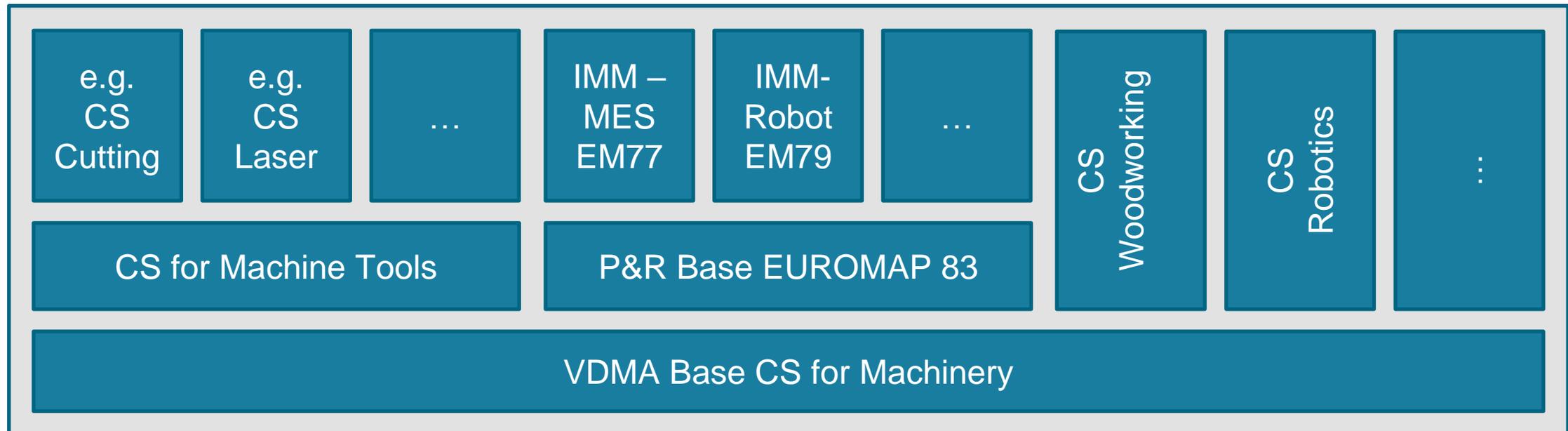
Published building blocks:

- Identification of machines/components
- Finding all machines and their components in a server



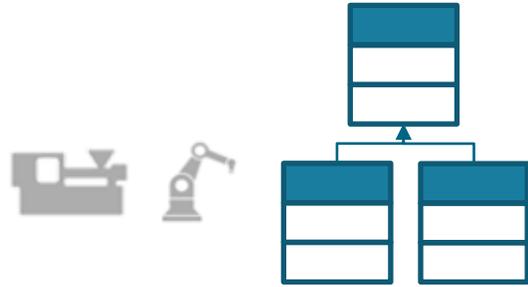
Planned building blocks :

- Machine States
- Job Management
- Result Transfer
- Energy Management



Levels of Interoperability

Industrie 4.0



Cross domain harmonized information models

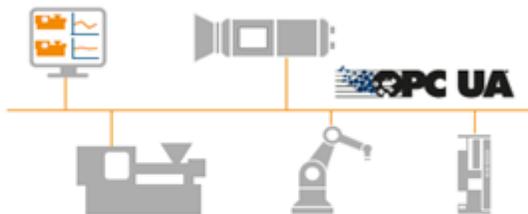
OPC UA for Machinery

Dissemination & Marketing with



Domain specific harmonized information models

35 Working Groups
> 600 Companies involved



Meshed communication network



I 3.0



Proprietary communication



Solution (2): Plug and Play Powered by a Global Community

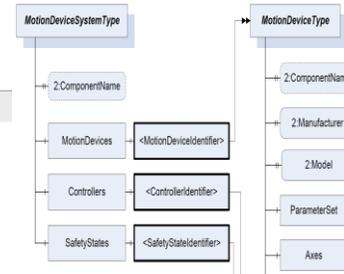


OPC 40010-1



OPC UA for Robotics
Part 1: Vertical Integration

Release 1.00



semantic interoperability

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Companion Specifications defining
contents for different applications
→ **WHAT** to communicate



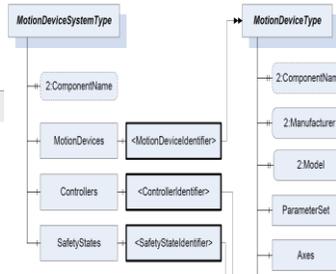
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OPC 40010-1

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= semantic interoperability

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Plug & play

Identical Implementation
of Companion Specifications
for the machinery sector



universal
machine technology
interface

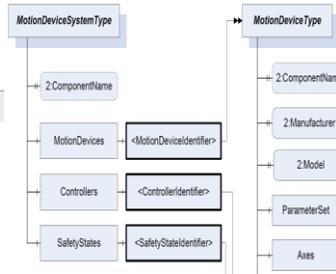
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OPC 40010-1

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Identical Implementation
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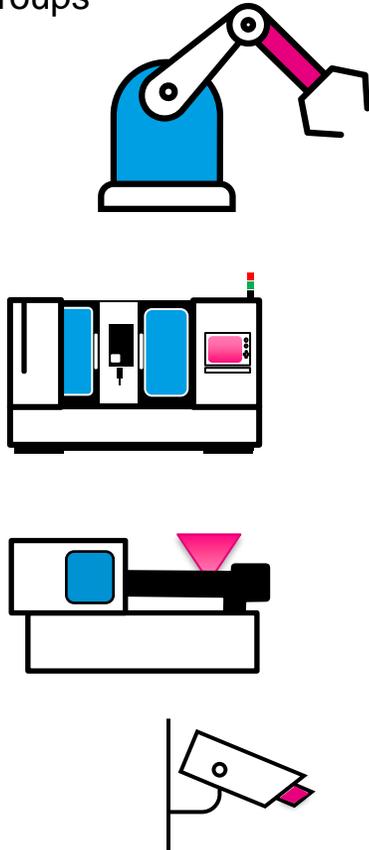
Global community

Promoting the use
of common standards

Bringing Machine Builders and Users Together

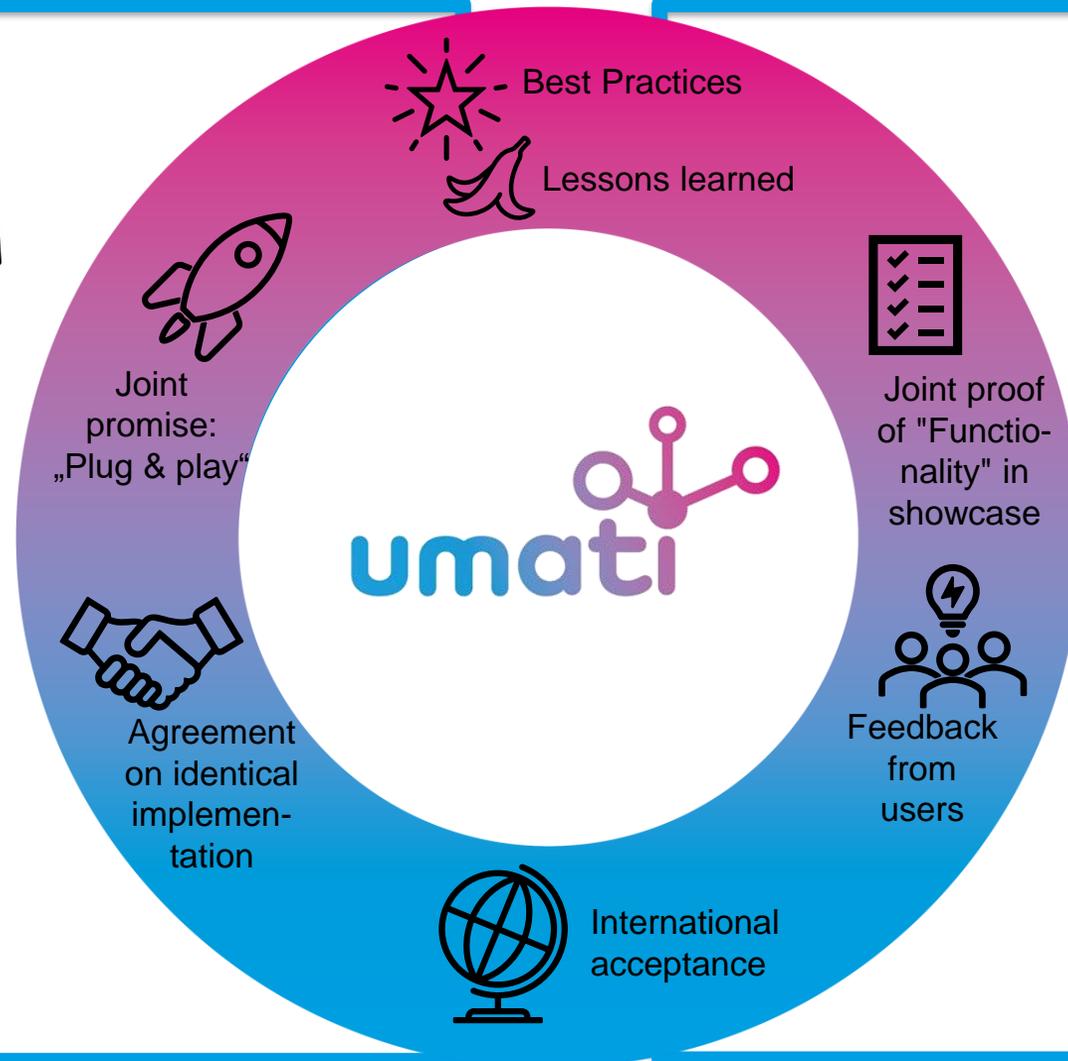
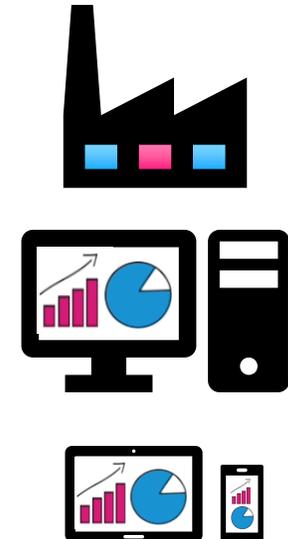
Machine Builders

Associations
Working Groups



Users

Various Sectors
Multiple Machinery



A Network of Strong Partners

core partners



consortium partners



2022-02-10

umati in a nutshell

association partners

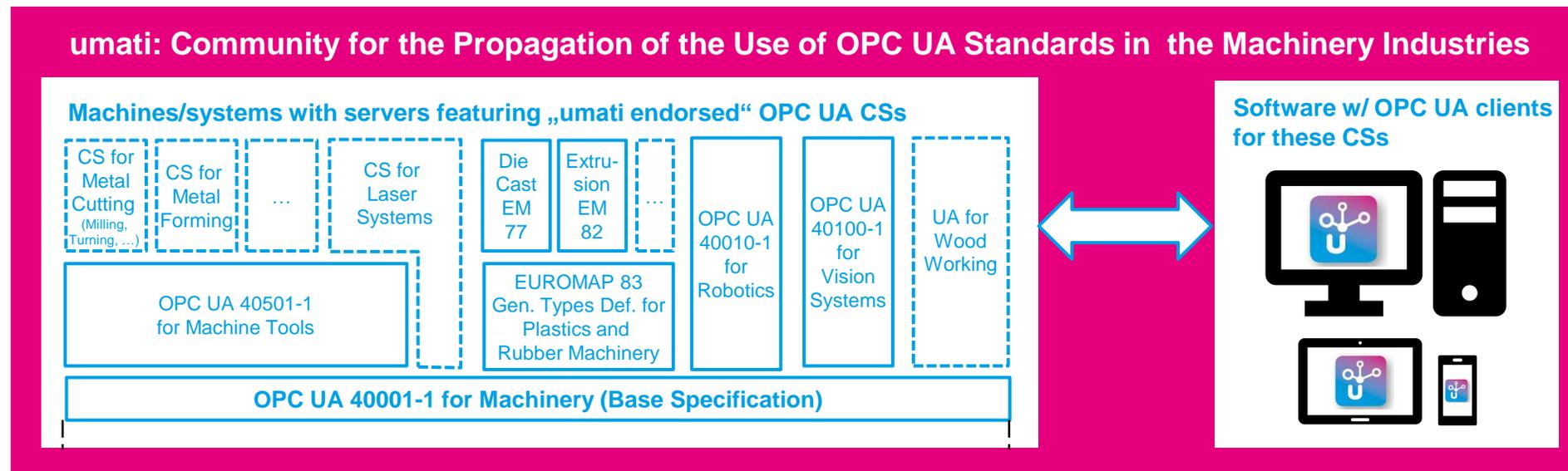


research partners

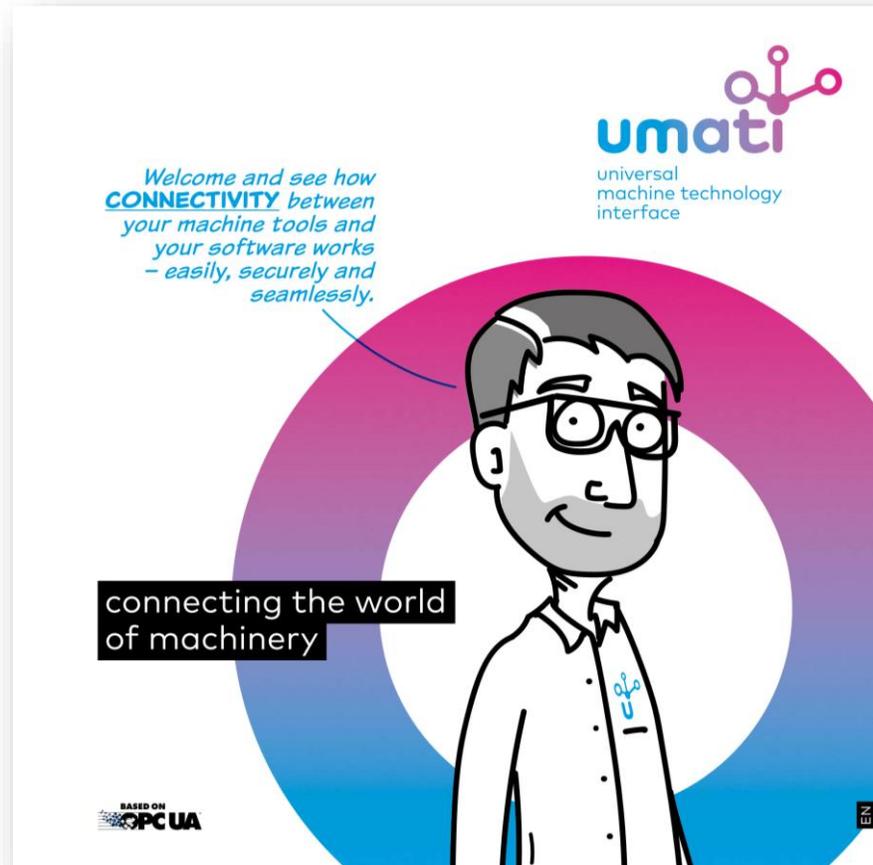
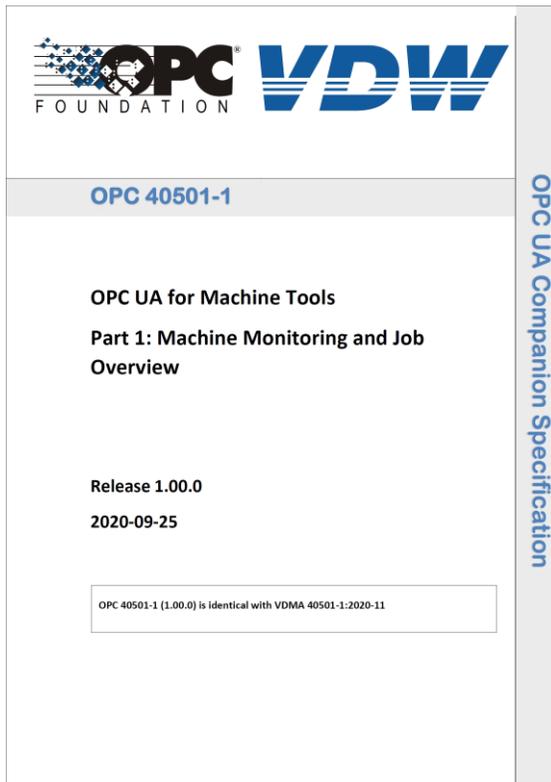


How does it work?

- umati uses (“endorses”) several OPC UA Companion Specifications (which can be used worldwide free of charge)
- umati integrates these CS into a common "framework", i.e. the communication specifications are standardized
- Communication specifications are set up on the OPC UA standard as far as possible. Where this is not possible because they do not yet exist or because they are not yet suitable for industrial use from the point of view of mechanical engineering, own specifications will be established (which can be replaced by more advanced standards at a later date)
- This does not affect the independent development of sector-specific standards, but will influence the necessary harmonisation in the medium term through feedback from the market



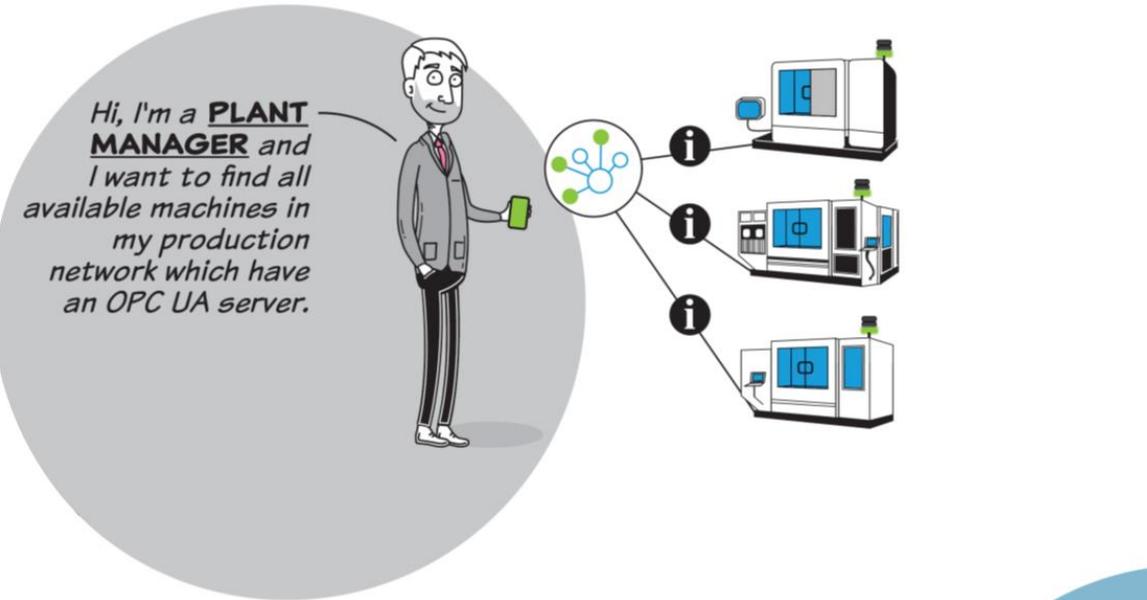
Example OPC 40501-1 UA for Machine Tools Use Cases and Roles



**Update: Release Candidate for
KPI extension to be released soon!**

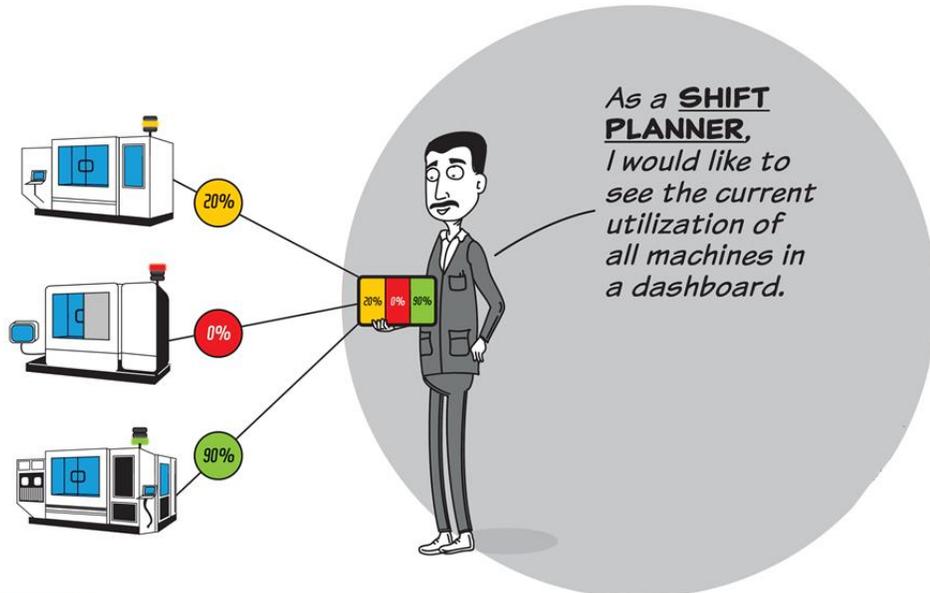
Use Cases mapped to Roles

Hi, I'm a **PLANT MANAGER** and I want to find all available machines in my production network which have an OPC UA server.



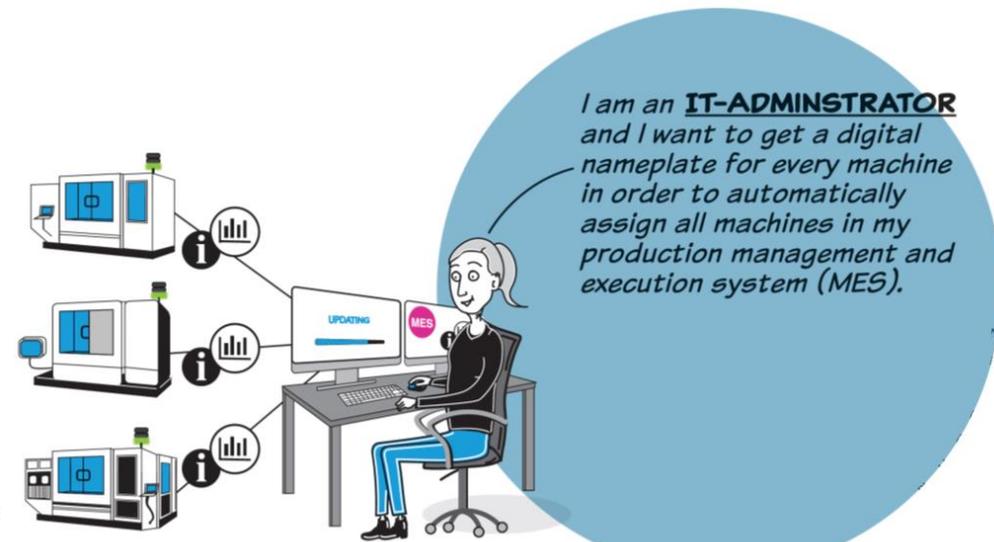
The diagram shows a plant manager character on the left holding a smartphone. A central node with a network icon is connected to three industrial machine icons on the right. Each machine icon has a small 'i' information icon next to it, representing the search for machines with OPC UA servers.

As a **SHIFT PLANNER**, I would like to see the current utilization of all machines in a dashboard.



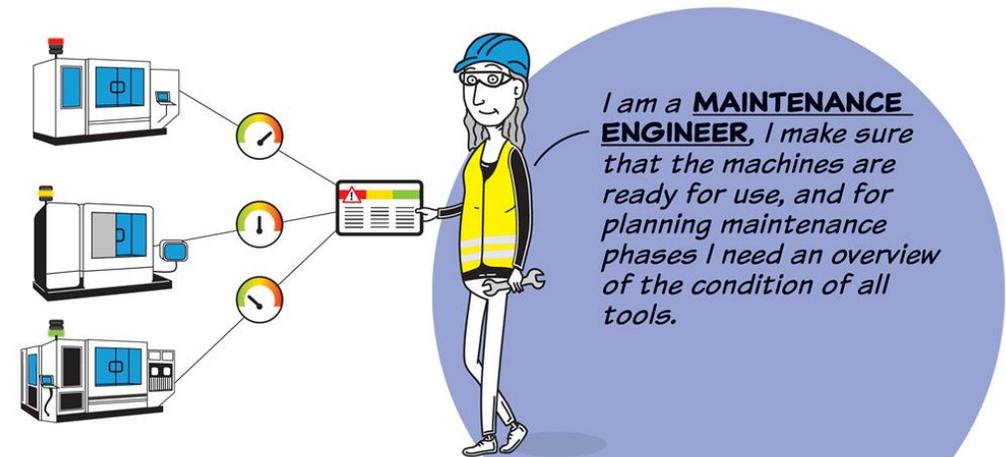
The diagram shows a shift planner character on the right holding a dashboard. On the left, three industrial machine icons are connected to colored circles representing utilization percentages: 20% (yellow), 0% (red), and 90% (green). The dashboard character is holding a small version of this data visualization.

I am an **IT-ADMINISTRATOR** and I want to get a digital nameplate for every machine in order to automatically assign all machines in my production management and execution system (MES).



The diagram shows an IT administrator character on the right sitting at a computer workstation. On the left, three industrial machine icons are connected to 'i' information icons and bar charts. The computer monitor displays 'UPDATING' and 'MES' status, representing the process of assigning digital nameplates.

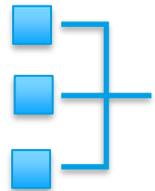
I am a **MAINTENANCE ENGINEER**, I make sure that the machines are ready for use, and for planning maintenance phases I need an overview of the condition of all tools.



The diagram shows a maintenance engineer character on the right wearing a hard hat and safety vest, holding a tablet. On the left, three industrial machine icons are connected to circular gauges and a central tablet icon displaying a maintenance overview, representing the monitoring of machine conditions.

umati Resources for a Live Demonstration

- Provide an „user experience“ for data flow
- Have an open, common set-up to which interested participants can connect
- Demonstrate that „criss-cross connectivity“ can be realized even at trade show conditions



Infrastructure
(Data Hub)



Dashboard
(umati.app)



Security



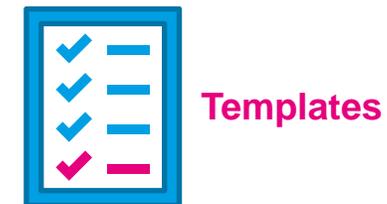
Templates



Marketing

umati Resources for a Live Demonstration

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2022-02-10 umati in a nutshell

Live experiences: umati@

- EMO Hannover 2019
 - 110 machines connected with
 - 28 software services
- METAV digital 2021
- Hannover Messe digital edition 2021
- Ligna Innovation.Network 2021
 - 15 machines
- EMO Milano 2021
 - 50 machines
 - 10 software services



Every connected machine features a sticker.



Scan the QR code or type the shortcut link to access the live data streaming from the machine.

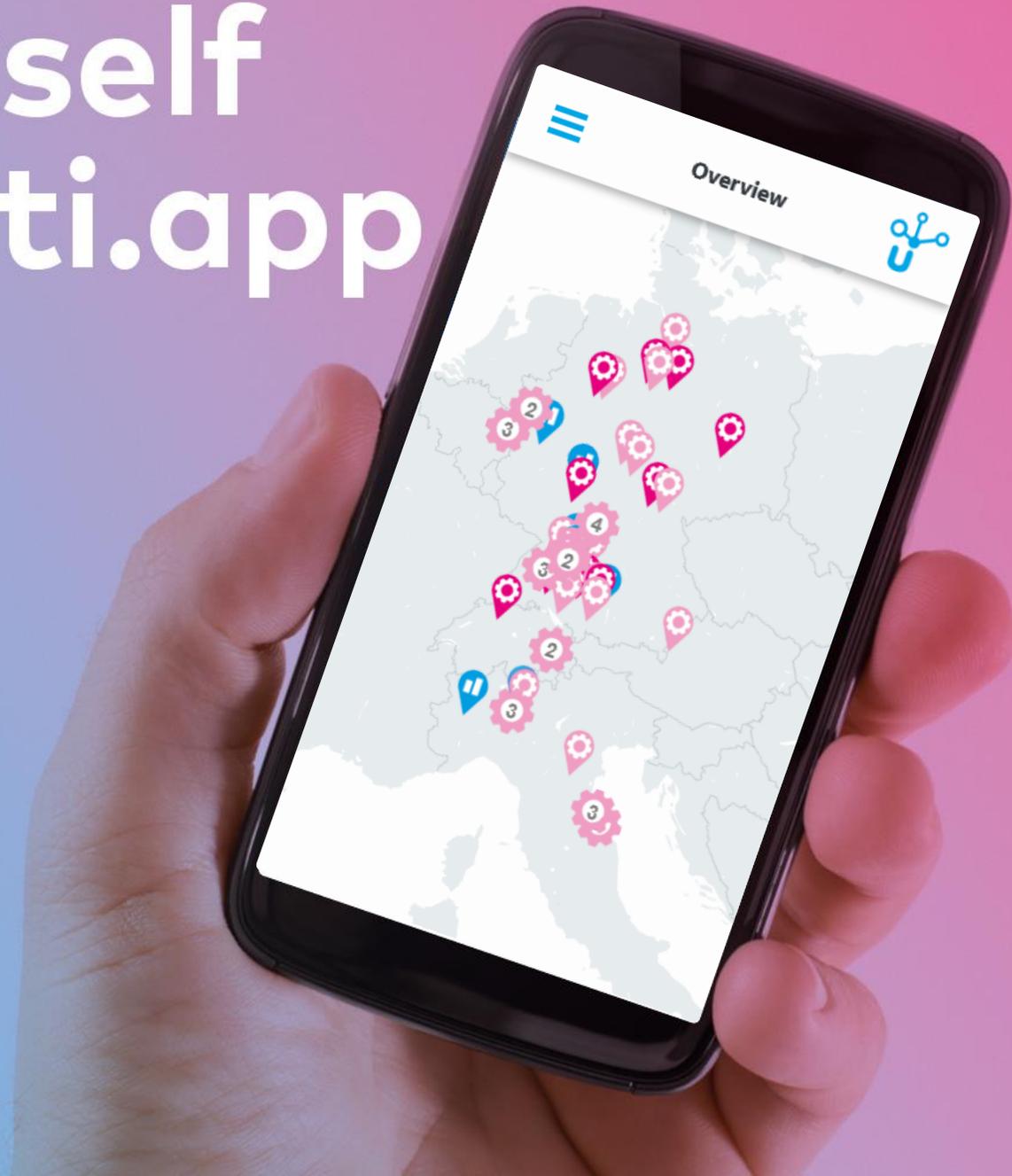
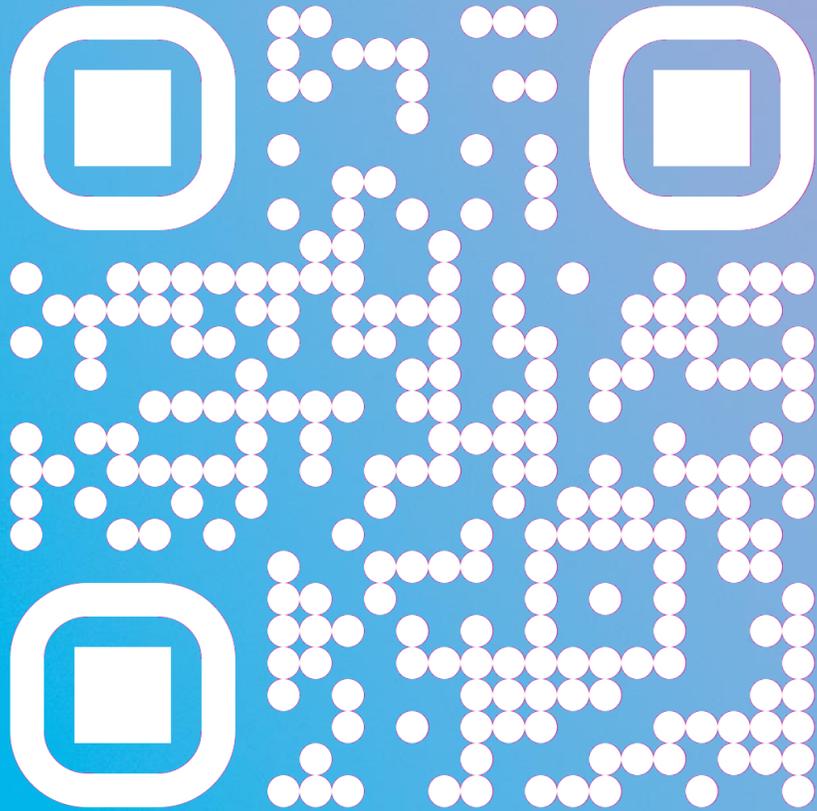


Get an overview of all the connected machines at <https://umati.app>

AMTech Shenzhen China 2021

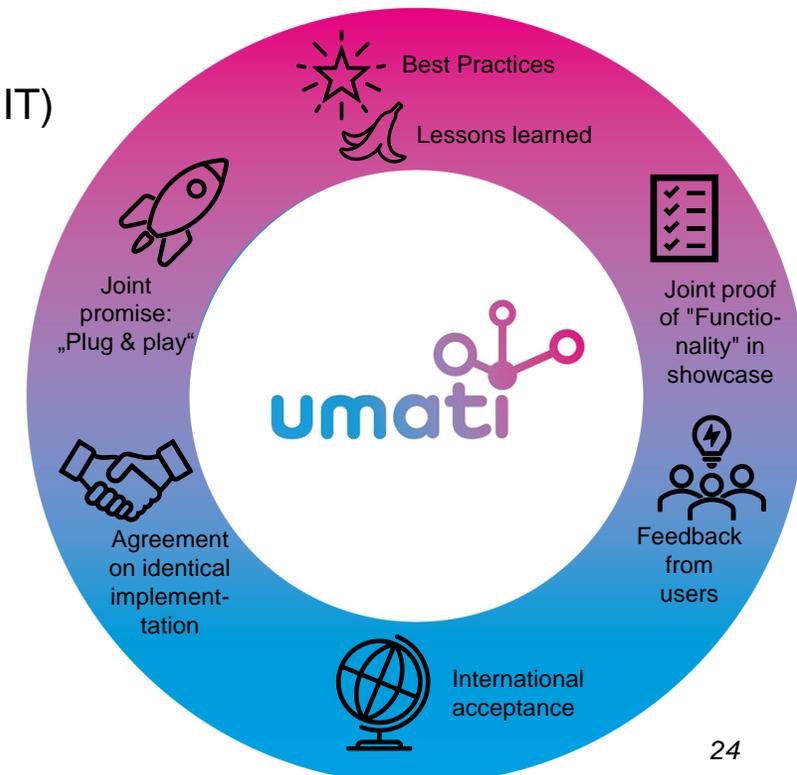


See for yourself <https://umati.app>



Summary

- Many OPC UA Comp.Spec. are under development
→ strong community for the „Global Production Language“
- Bottom-Up approach by technology + specific harmonization useful
→ balance interests, focus on common targets
- Technologies (specifications) „come together“ at the customer’s site
→ demands true interoperability for customer-specific ecosystem (machines + IT)
→ serve as single point of contact towards the customer
- Harmonized implementation exceeds playing field of single working group
→ learn and share expertise, demonstrate and prove functionality
→ via an open demonstration infrastructure
→ also viable for trade shows
- Openness to global participation
→ set THE standard, not just A standard
- Joint marketing under an internationally visible brand: **umati**
→ overcome the chicken-and-egg issue **together**



Need more info...?

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