



umati

universal
machine technology
interface

Welcome and see how
CONNECTIVITY between
your machine tools and
your software works
– easily, securely and
seamlessly.

connecting the world
of machinery

BASED ON
OPCUA

You want to connect the machines on your shop floor to your IT system, such as MES or ERP? You want to exploit your data to make your production more efficient, reduce waste and cost, and save money? umati is here to help!

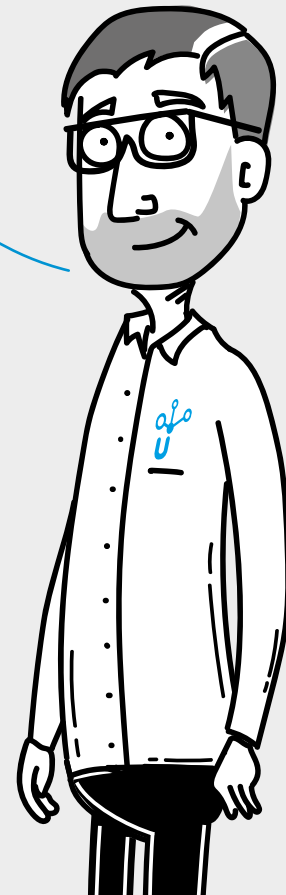
*It's very easy!
umati relies on
**OPEN INTERFACE
STANDARDS**
based on OPC UA.*

This brochure helps you to determine what you need with respect to the **OPC 40501-1 (UA4MT)** companion specification:

- **Check** which use case is appropriate for your needs.
- Find out which **UA4MT profiles and facets** contain the data you require.
- Discuss the availability of these items with your **equipment or software supplier**.

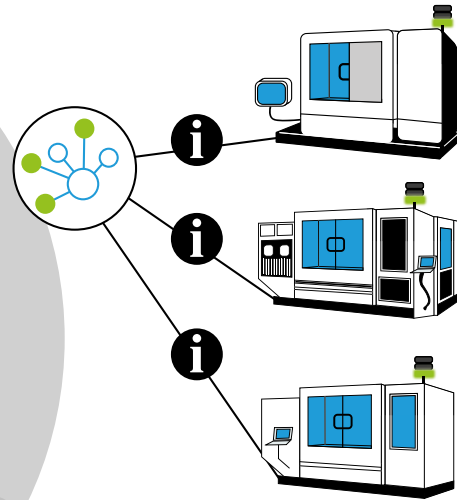
OPC UA is created in a modular way to allow for maximum flexibility:

- **Data items and features** are defined in (companion) specifications.
- ConformanceUnits are sets of data items and features
- **Profiles** are stand-alone, named aggregations of ConformanceUnits or Profiles. They can be mandatory or optional.
- **Facets** are like profiles, but they can only be used in combination with other Profiles only.



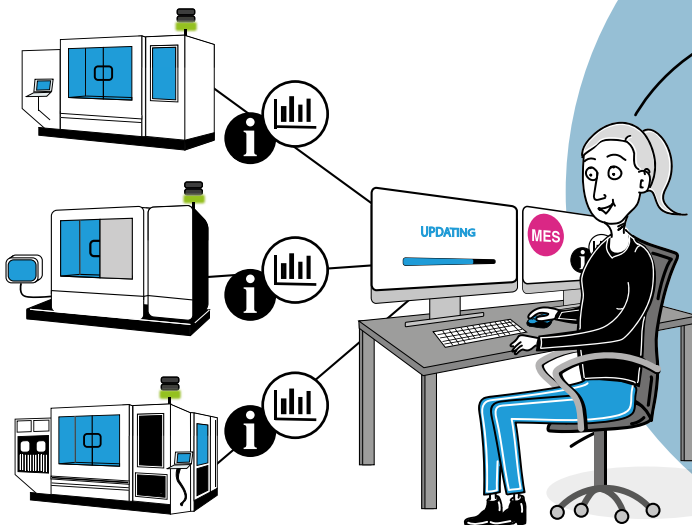
UA4MT use cases

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

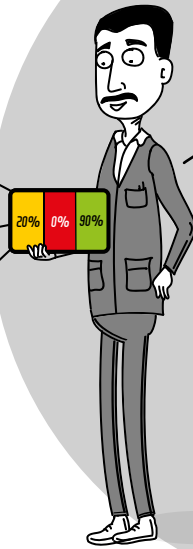
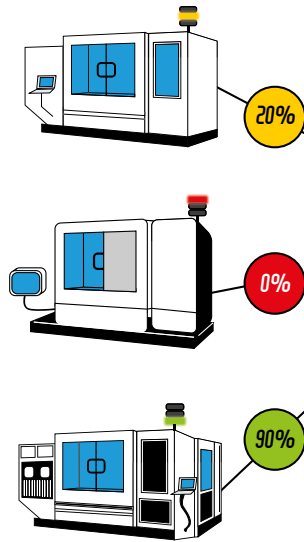


- ★ The MachineTool **Basic Server Profile** allows OPC UA clients supporting the UA4MT to identify all machines after their OPC UA server has been identified by a network scan.
- ★ Machines have an identical, predefined structure in the server.

*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 MachineTool **Basic Server Profile** of the UA4MT provides the machine manufacturer and the serial number.
- ★ The MachineTool **Monitoring Server Facet** provides further details about the status of the working component (spindle, laser, EDM generator), the current software version as well as the model name and the year of manufacture

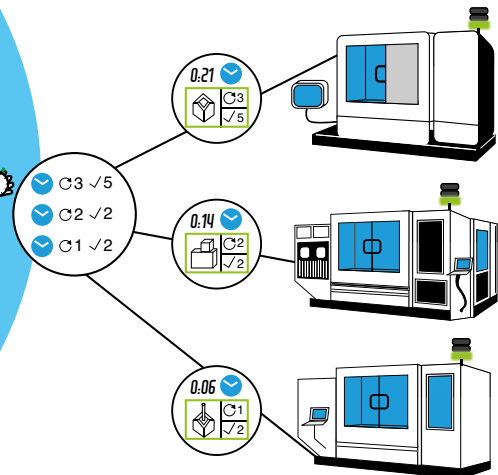


As a **SHIFT PLANNER**,
I would like to see the current utilization of all machines in a dashboard.

- ★ In the MachineTool **Basic Server Profile** of the UA4MT, the current operation mode as well as the color of the stack light are provided via OPC UA. In addition, the currently running program can be displayed.

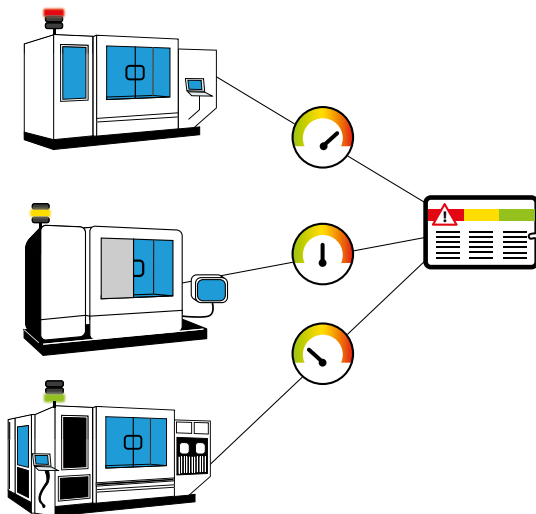
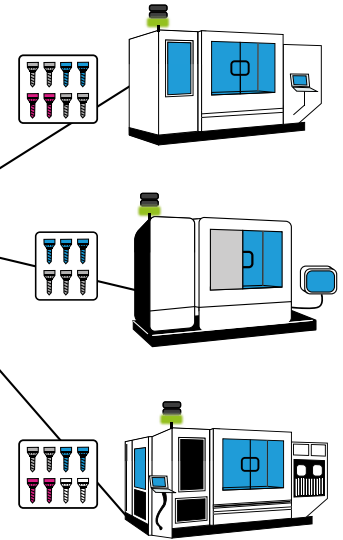
As a **PROCESS PLANNER** I want to have an overview of all running jobs.

- ★ The currently running program is already included in the MachineTool **Basic Server Profile** of the UA4MT.
- ★ Further information is contained in the MachineTool **Production Server Facet**. This allows a defined state machine to be identified and a static job list and the number of job runs to be displayed.
- ★ In addition, the MachineTool **Production Plan Server Facet** also includes a dynamic job list.



For **JOB PLANNING**,
it is important
to know the available
tools in the machines
in order to keep
changeover times low.

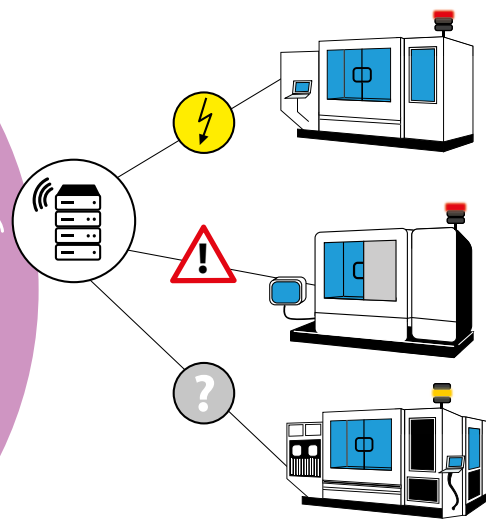
★ The MachineTool **Tools Server Facet**
can be used to determine the tools
currently available in the machine.



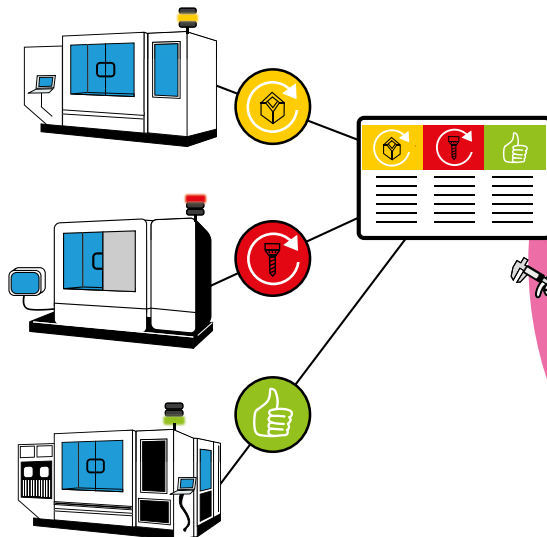
I am a **MAINTENANCE ENGINEER**, I make sure that the machines are ready for use, and for planning maintenance phases I need an overview of the condition of all tools.

★ The service life of each individual tool in a machine can be monitored with the MachineTool **Tool Life Server Facet**.

I am the **SHIFT SUPERVISOR**, I want to be informed by the machine via OPC UA as soon as errors occur or warnings are issued.



★ With the MachineTool **Errors and Alerts Server Facet** it is possible to subscribe to the error messages and alerts displayed on the operator panel on OPC UA clients. This way, the messages as well as the associated components are displayed.



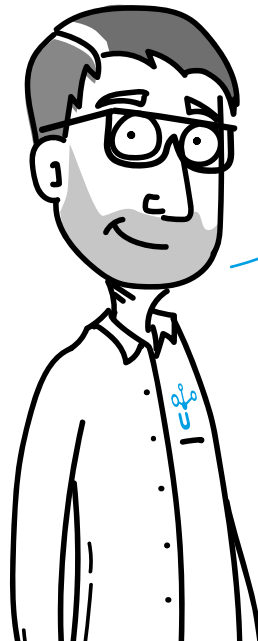
I am a **MACHINE OPERATOR**, I would like to be able to see in the control room when the next interaction with a machine will be necessary.



★ The MachineTool **Prognoses Server Facet** provides the predicted duration for a variety of future machine operations, such as when the next tool change is necessary, when the next maintenance is due, ...

UA4MT user profiles

User Profile	Basic Server Profile	Facets
	<i>mandatory</i>	
PLANT MANAGER	*	
SHIFT PLANNER	*	
IT ADMINSTRATOR	*	Monitoring Server Facet
PROCESS PLANNER	*	Production Server Facet + ProductionPlan Server Facet
JOB PLANNUNG	*	Tools Server Facet
MAINTENANCE ENGINEER	*	Tool Life Server Facet
SHIFT SUPERVISOR	*	Errors and Alerts Server Facet
MACHINE OPERATOR	*	Prognoses Server Facet



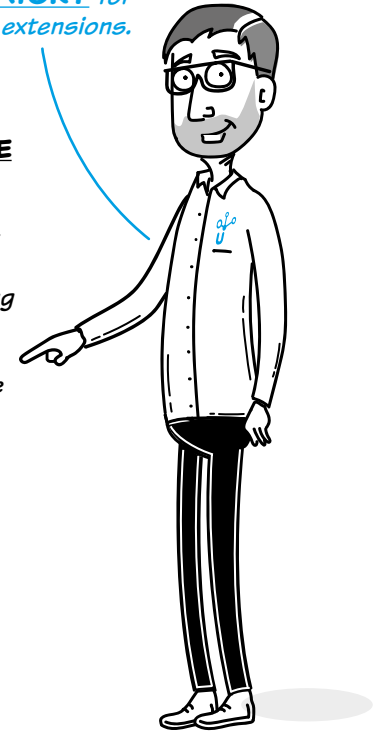
*As you can see:
for every **USER**
the right solution!
For detailed information
about UA4MT facets
see the next few pages.*

UA4MT profiles and facets

	Basic Server Profile
	mandatory
Overview of machinery	Machine is available on the server with defined structure
General information about the machine	Manufacturer Serial Number Product Instance Uri
Overview of the channels of the machine	All channels of the machine are available: <ul style="list-style-type: none"> • Name • State • Mode • Feed Override
What is the Machine State?	Overall Operation Mode available. Stacklight represented by server
Is the production running?	Currently active program is available (name and state)

Don't forget: the Basic Server Profile is ***MANDATORY** for all extensions.

The **BASIC SERVER PROFILE** defines a Profile that describes the minimum required content and address space functionality any machine tool server shall provide as a minimum. Concerning Stacklights and Channels, it is expected that a server will model these elements if they are available on the machine tool.



The **MONITORING FACET** provides additional monitoring information.

	Basic Server Profile	Monitoring
	mandatory	
More detailed information about the machine	*	Component Name Model Date of Construction Device Class
Overview of the working units within the machine	*	Working Units that are available on the machine are represented on the server: <ul style="list-style-type: none"> • Spindles (is Rotating) • EDM Generator (state, is on) • Laser (state, controller on)
Information about software on the machine	*	Software Identifier Software Revision

The **PRODUCTION FACET** contains enhanced information about the production on the machine tool compared to the MachineTool Basic Server Profile. It adds Transition Events for the state machine of each Production Job Type node.

The **PRODUCTION-PLAN FACET** uses the Production Plan as a dynamic list. Jobs can be added and deleted to mirror the job list on the machine tool more closely. The OPC UA server can show jobs scheduled for future production and jobs that are finished in this list along with one or multiple active jobs. The Production Job State Machine enables OPC UA Clients to distinguish between these states.

	Basic Server Profile	Production	Production Plan	Optional Job AddOn – Partsets No specified Facet!	Optional Job AddOn – Parts No specified Facet!
	mandatory	Not compatible with Production Plan Facet	Not compatible with Production Facet	Requires Production or Production Plan	Requires Production Plan (possible with Production, but not recommended!)
What job is running?	*	Current job, including the active program (+ static Program-List)	Current job, including the active program (+ dynamic Program-List)		
Which jobs are in finished and in queue?	*	Static Job-List: current job + fixed number of placeholder for queued or finished jobs. (fixed list-length!)	Dynamic Job-List: current job + possibility to add new and delete old jobs during runtime.		
How many job repeats are planned and completed?	*	Counter: • Runs planned • Runs completed	Counter: • Runs planned • Runs completed		
Time data of production (total job)	*	State Machine for jobs and programs with Transition Events and timestamps for State-Changes	State Machine for jobs and programs with Transition Events and timestamps for State-Changes		
Time data of production (individual parts of a job)	*		*	*	Transition Events for (finished) parts with timestamp
How many parts are already produced?	*	*		Partsets with counter	
How many good parts are already produced?	*		*	*	Single parts (including Part Quality, as far as the machine can determine)
What's the state of the parts in production?	*		*	*	Single parts are available within partsets, possible State Machine for each part

The **TOOLS FACET** contains the information about tools in the machine tool. If the list of tools is used dynamically, the Conformance Units MachineTool Event Propagation and MachineTool Event Tools shall be provided.

The **TOOL LIFE FACET** provides the tool life data for tools in the machine tool.

	Basic Server Profile	Tools	Tool Life
	mandatory		Requires Tool
Data about used tools	✳	All tools (and Multi Tools) are available	
Tool Life of used tools	✳	✳	Tool Life available for every tool (at least one counting method)

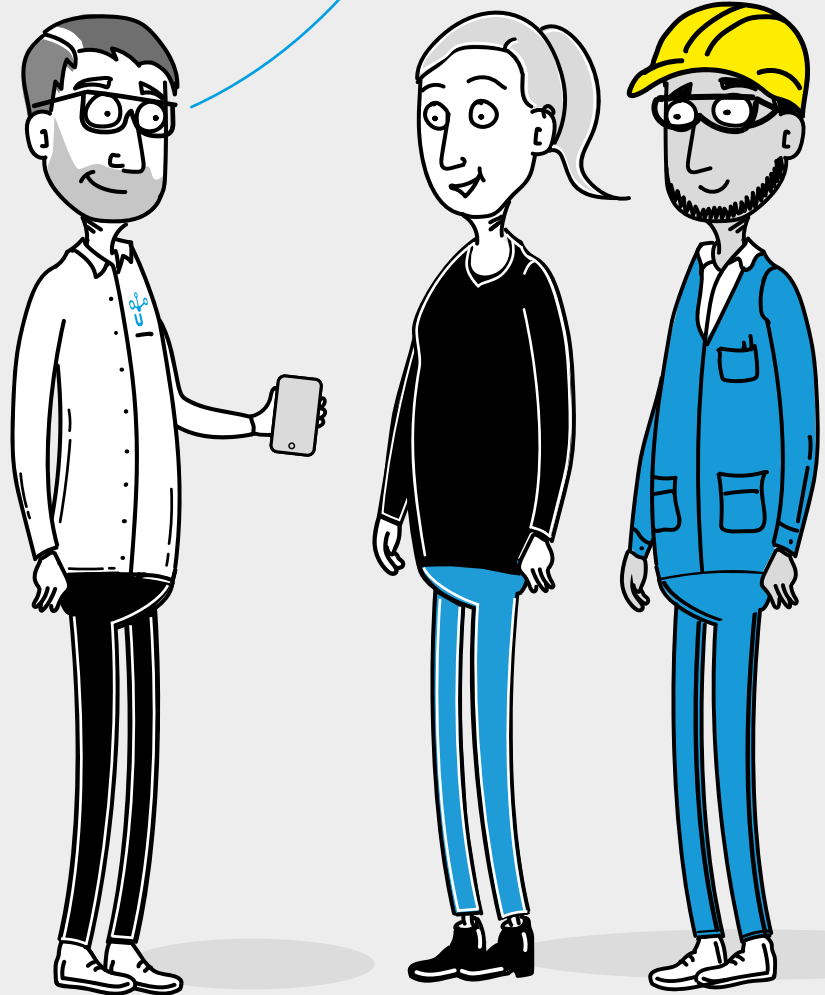
The **ERRORS AND ALERTS FACET** contains the Conformance Units concerning errors and alerts sent by the machine tool.

	Basic Server Profile	Errors and Alerts
	mandatory	
Warnings and Error-Messages	✳	Warnings/Errors shown on HMI are sent via OPC UA Server

The **PROGNOSES FACET** provides prognoses for the machine tool.

	Basic Server Profile	Prognoses
	mandatory	not all prognoses available for all machines
Prognoses for upcoming necessary manual activities, finished jobs, ...	✳	Prognosis Events (with Type) are sent with predicted time for actual incidence. Included types in Spec: <ul style="list-style-type: none"> • Maintenance Prognosis • Manual Activity • Part Load • Part Unload • Process Changeover • Production Job End • Tool Load • Tool Unload • Tool Change • Utility Change

You need information
about umati? Have a
look at UMATI.ORG



a network of strong partners



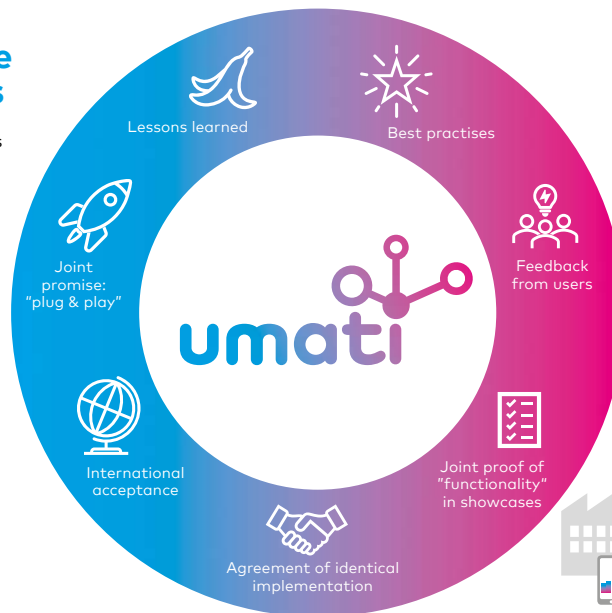
umati is a global community whose purpose is to introduce a common interface concept based on OPC UA to the market and to foster the acceptance and implementation of these standards. umati started as an alliance of companies from the machine building industries.

Our mission is to provide and demonstrate the common user benefit of true "plug and play" functionality in the field of machinery.

The number of umati partners is growing continuously. To see who has already endorsed umati, visit www.umati.org/partners

Machine builders

Associations, working groups



Users

Various sectors, multiple machinery



umati brings together machine builders, software producers and users in a strong community. They share their experience to benefit from identical implementation of OPC UA standards.

umati is operated by



VDMA – Mechanical Engineering Industry Association
www.vdma.org



VDW – German Machine Tool Builders' Association
www.vdw.de

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