



umati brownfield hackathon

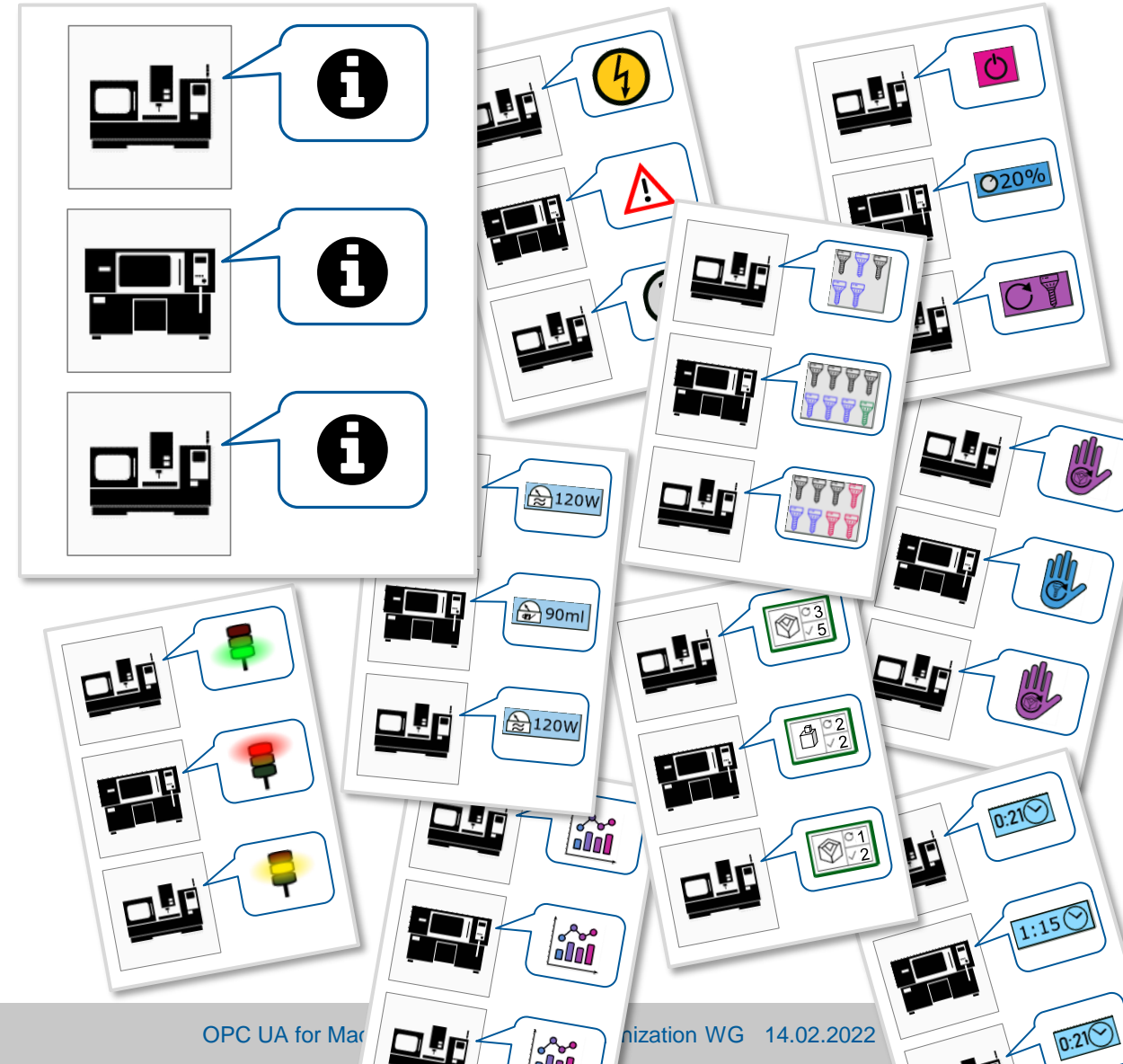
Götz Görisch, German Machine Tool Builders Association (VDW)

Tonja Heinemann, ISW, Universität Stuttgart

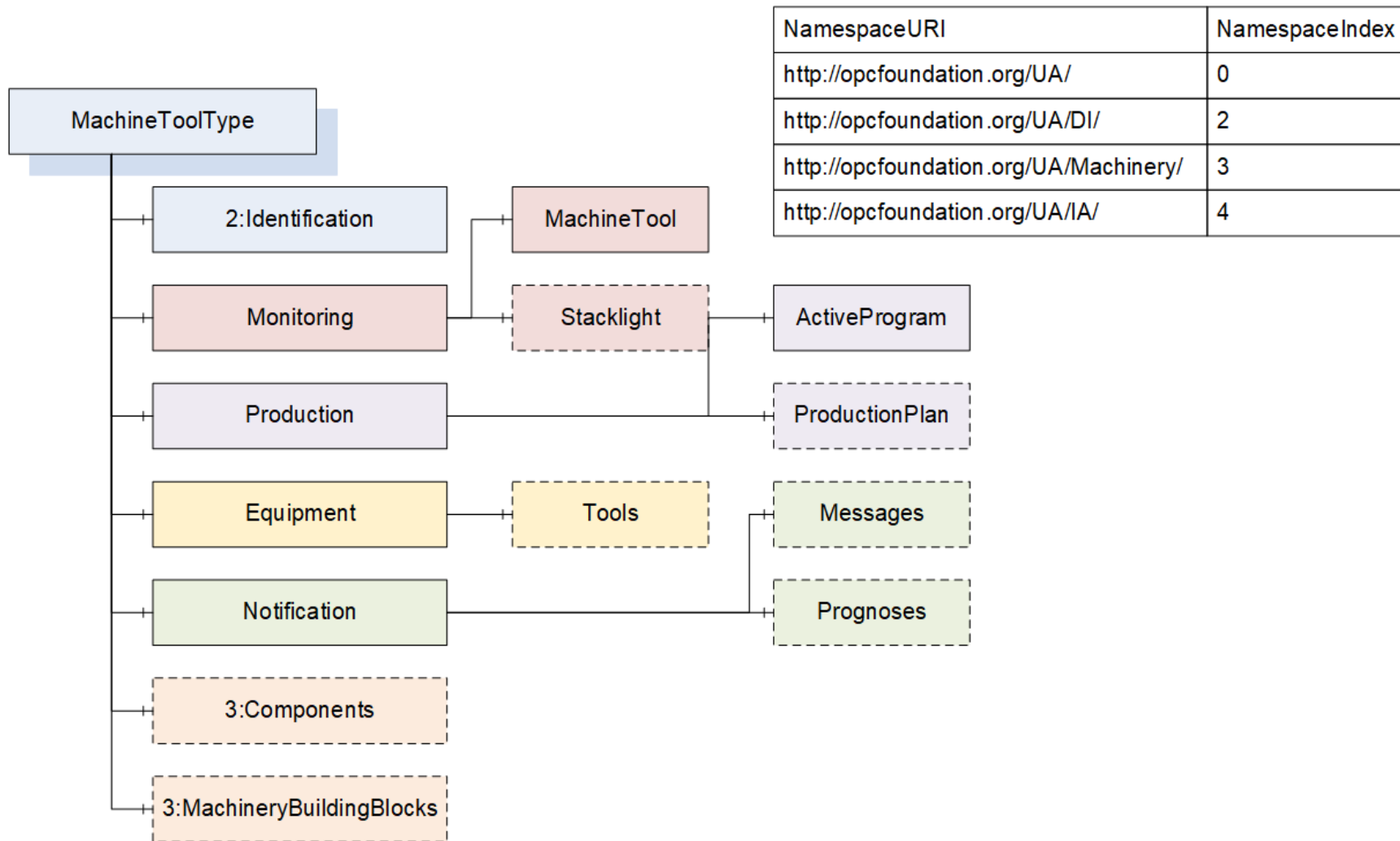
Machine Tools Use Cases

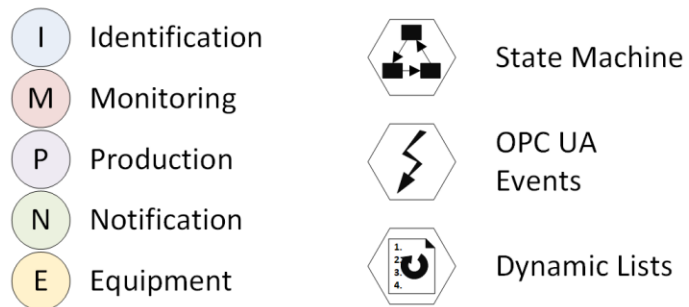
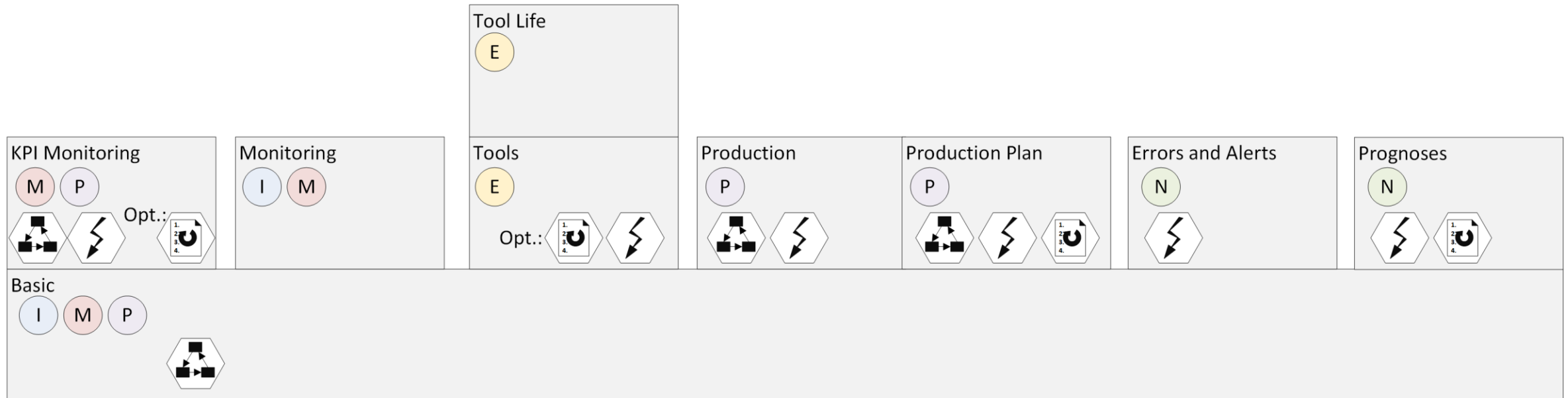


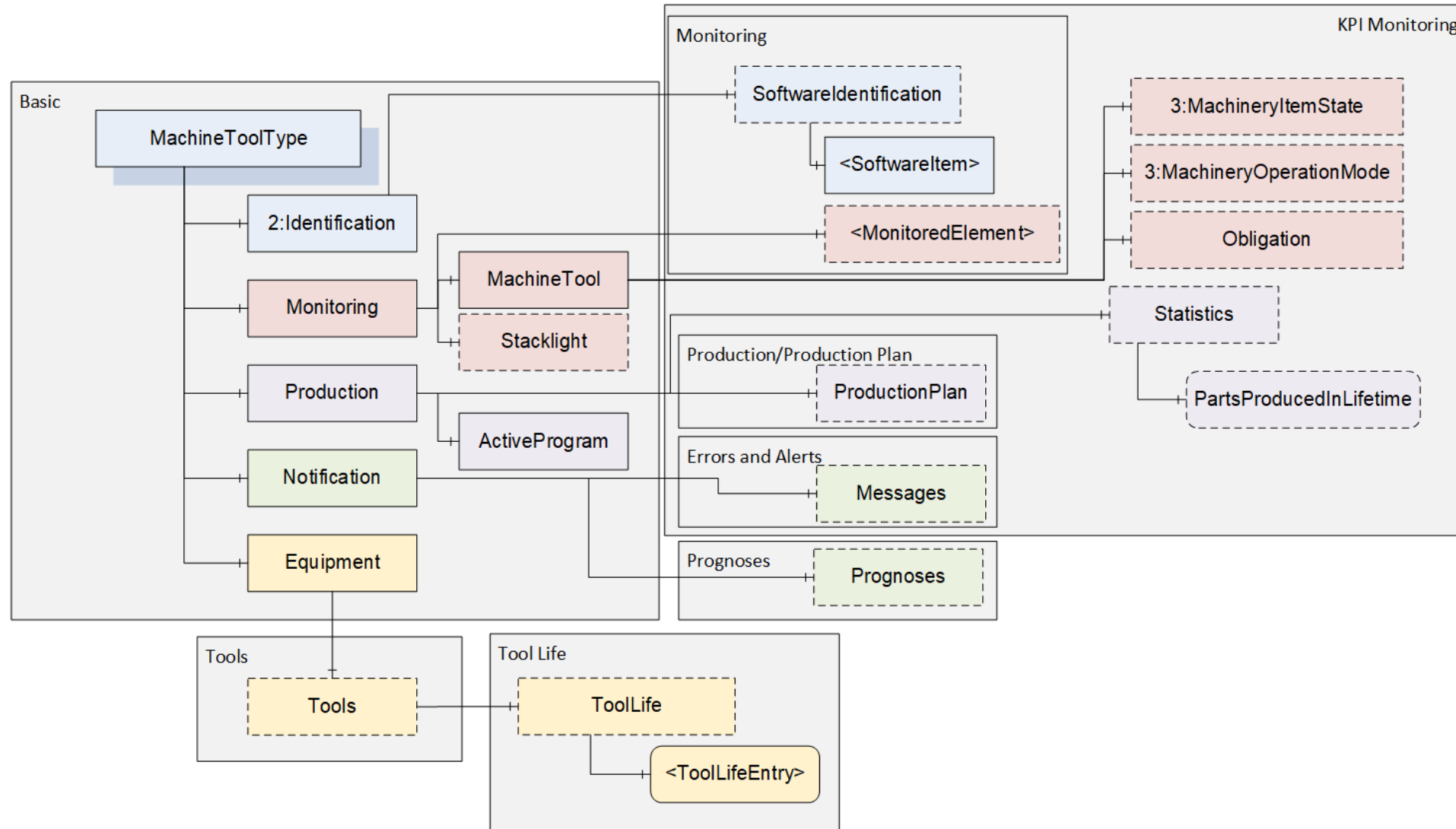
- 1 Identify machines of different manufacturers
- 2 Overview if production is running
- 3 Overview of parts in a job
- 4 Overview of runtimes for a job
- 5 Overview of machine tool state
- 6 Overview of upcoming manual activities
- 7 Overview of errors and warnings
- 8 Providing information for KPI calculations
- 9 Providing an overview of tool data
- 10 Providing OPC UA for Machinery Use Cases



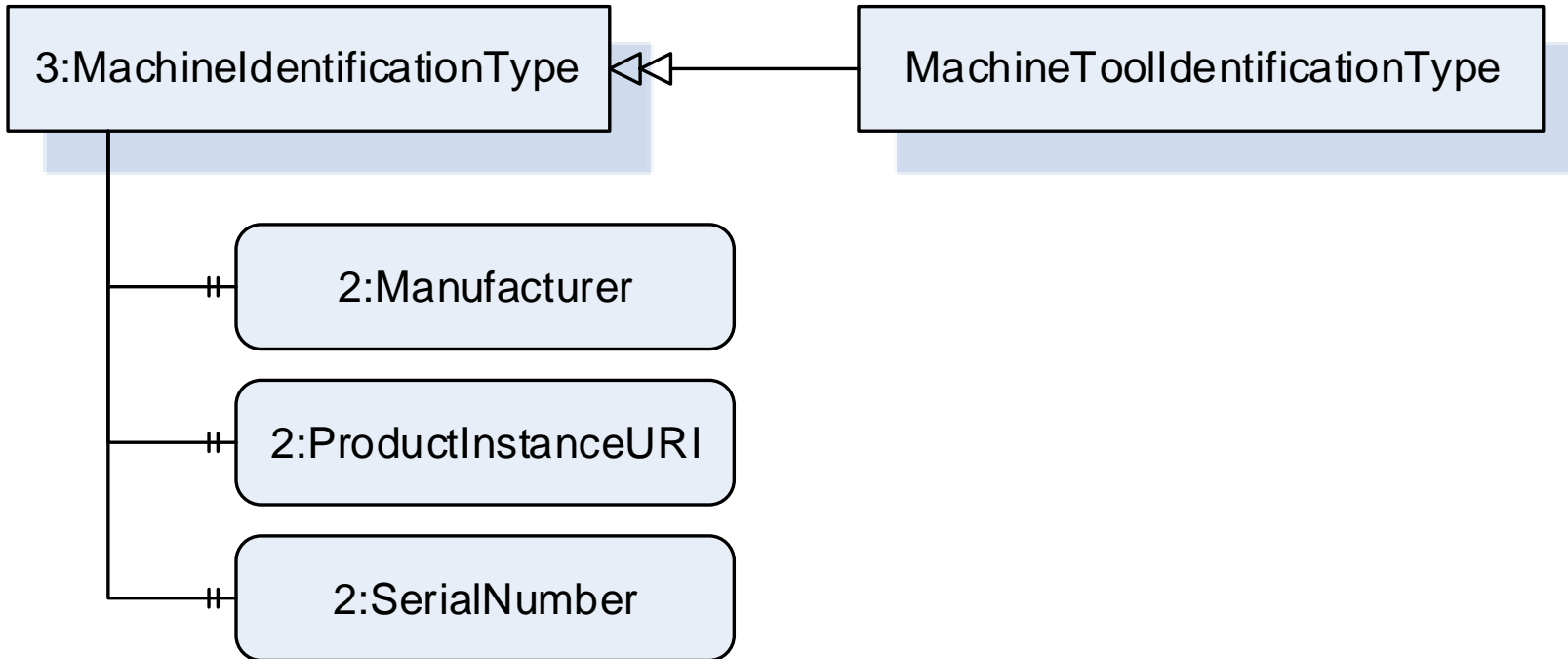
Machine Tools Information Model

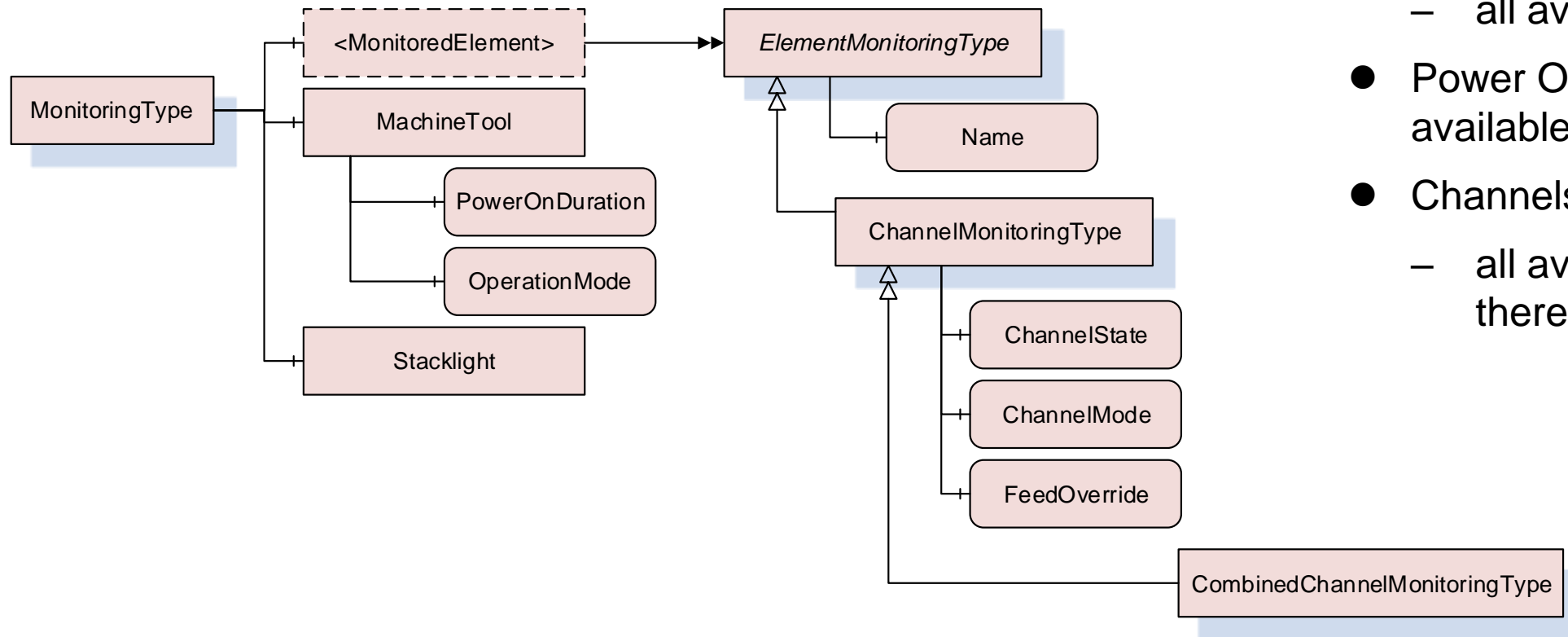




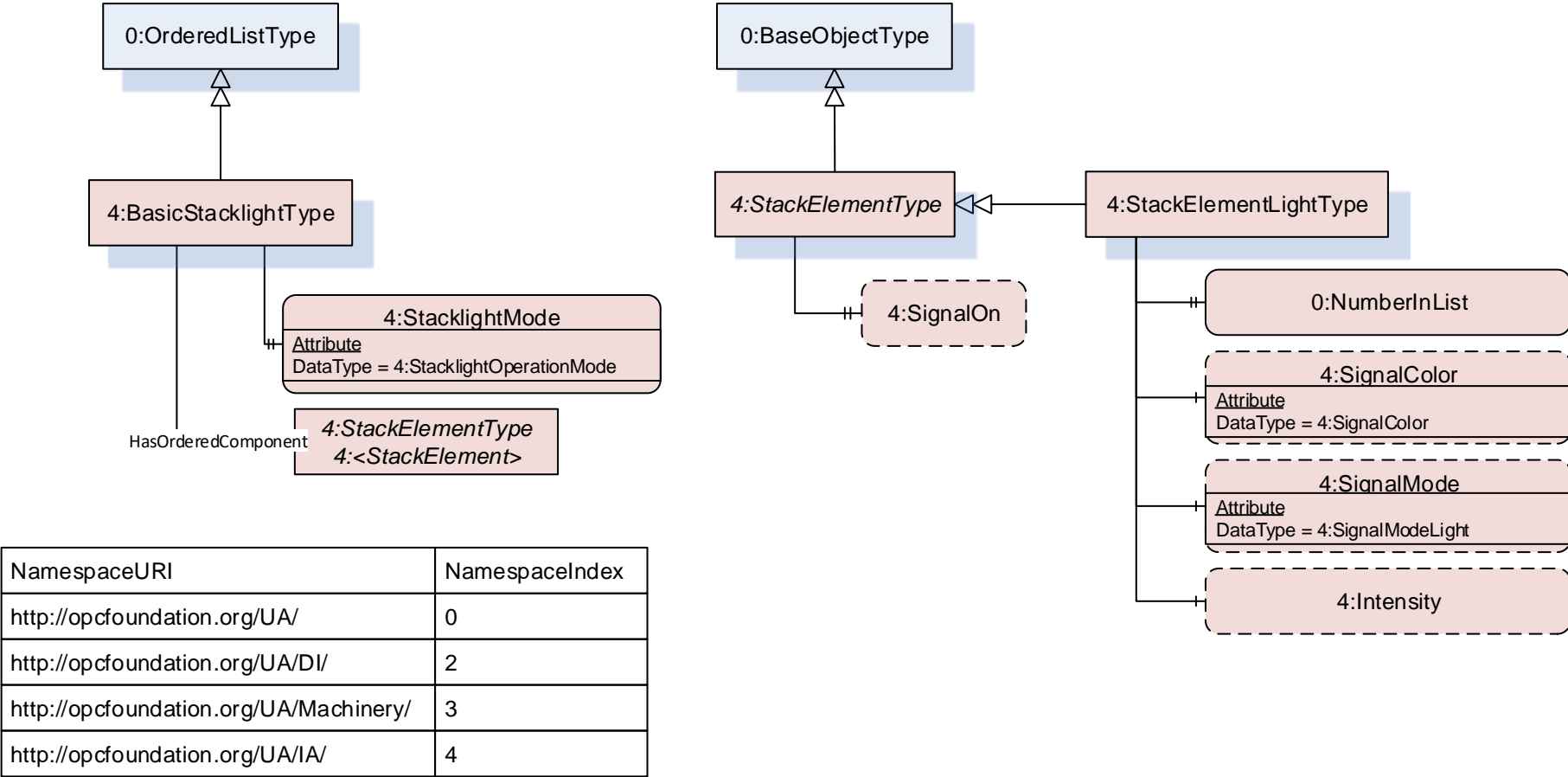


Identification - Mandatory Nodes

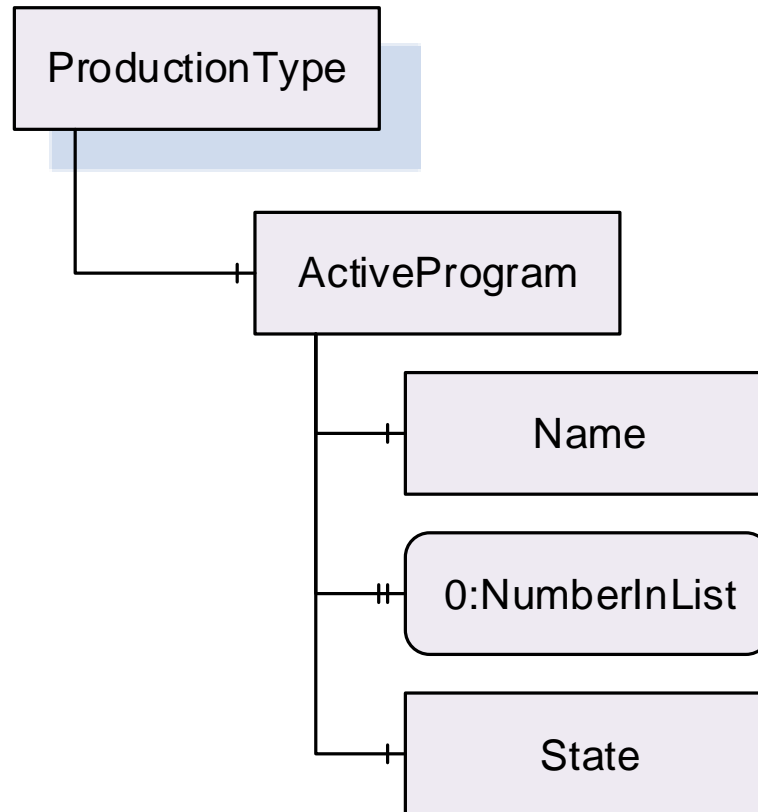


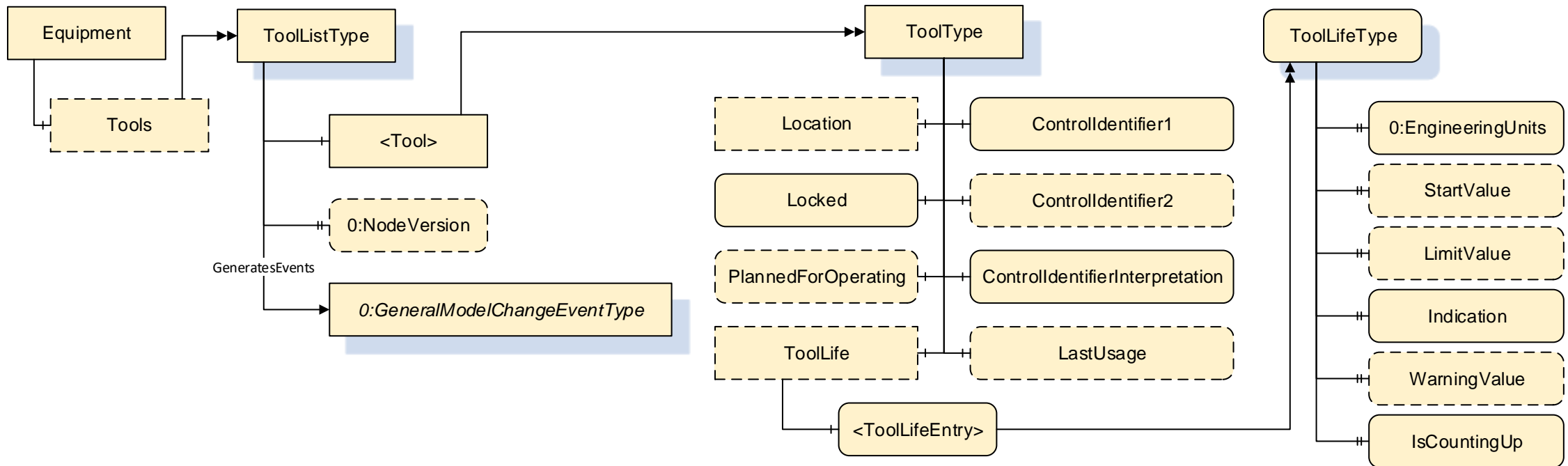


- Stacklight
 - all available stacklights
- Power On Duration (is available)
- Channels
 - all available channels are there

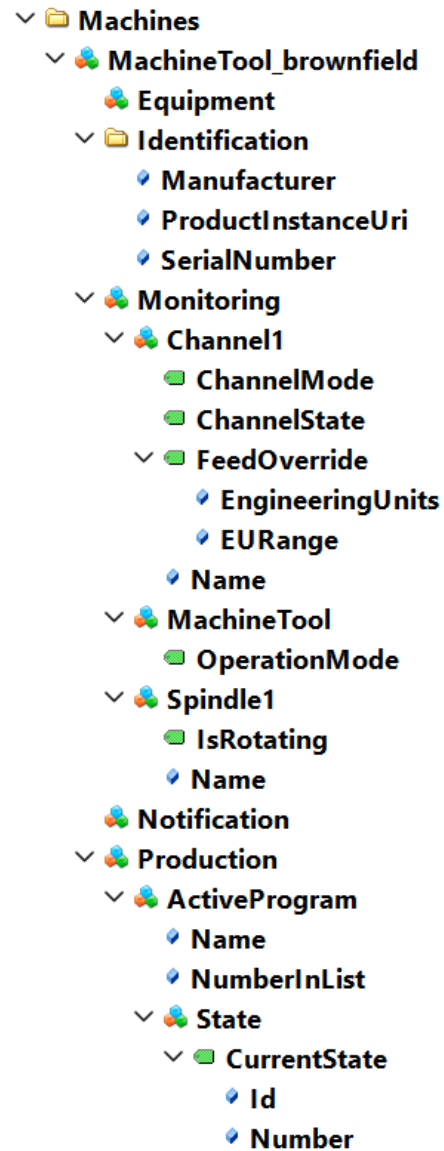


Production as used in Basic Profile





Example Instance





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CS Editor and Modelling expert

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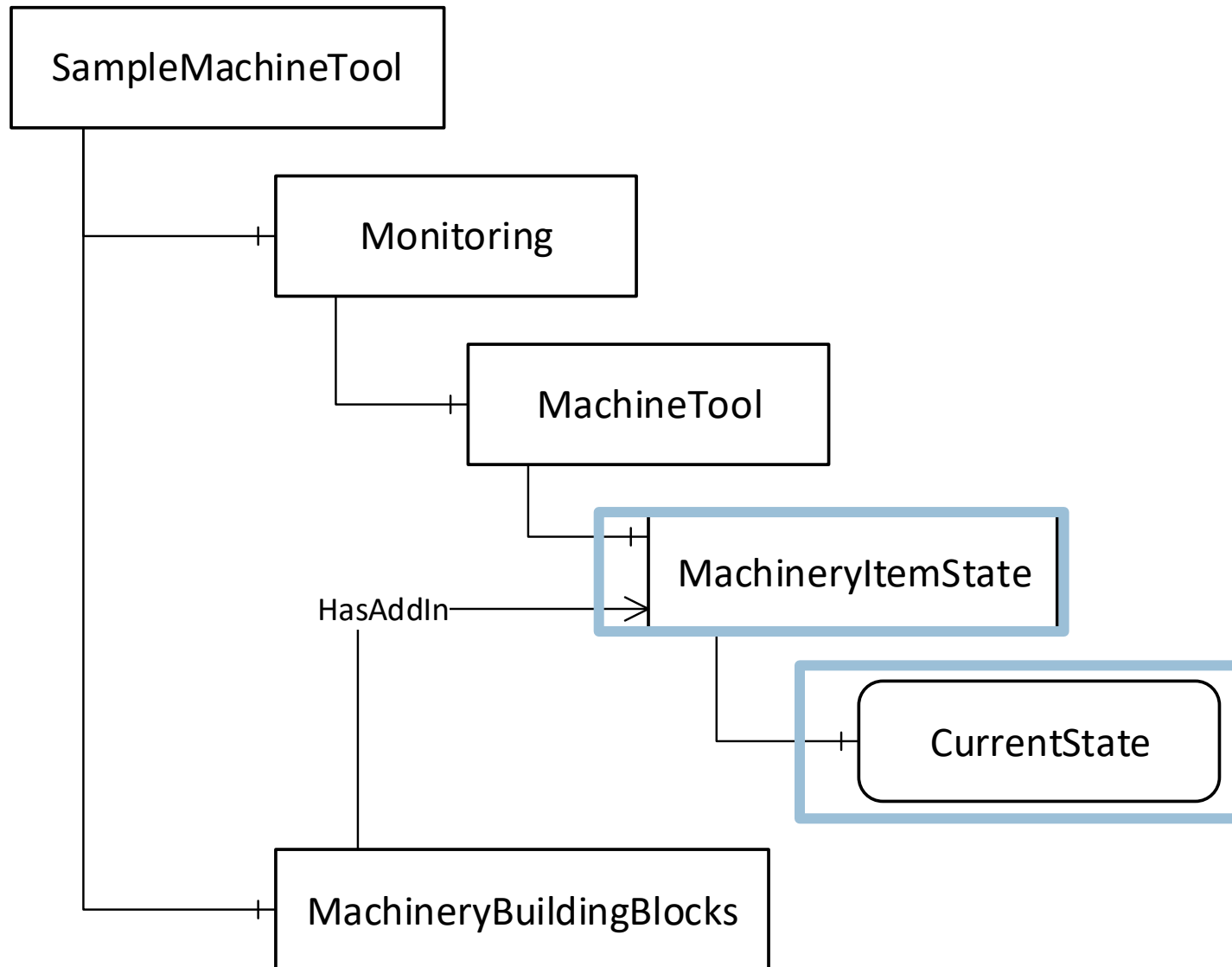
Thank you
for your attention!

For further information please contact: Goetz Goerisch g.goerisch@vdw.de

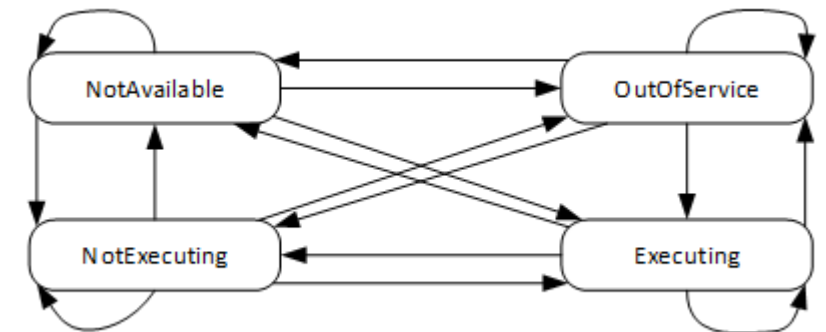


- Global State (MachineryItemState)
- Global Mode (MachineOperationMode)
- Global Failure
- Efficiency (PartsProducedInLifetime / PartsCompleted)
- Quality indicator (PartsGood)
- Obligation
- Maintenance

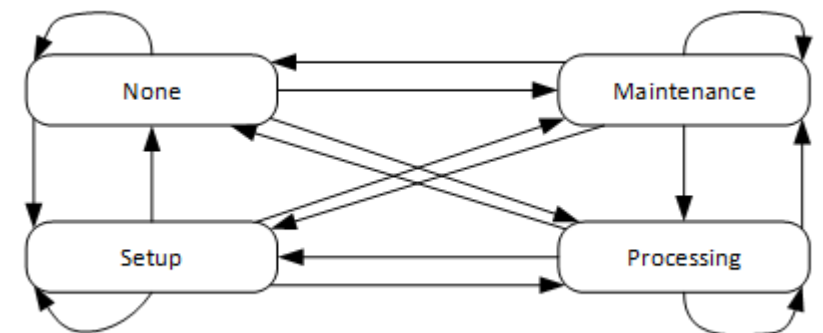
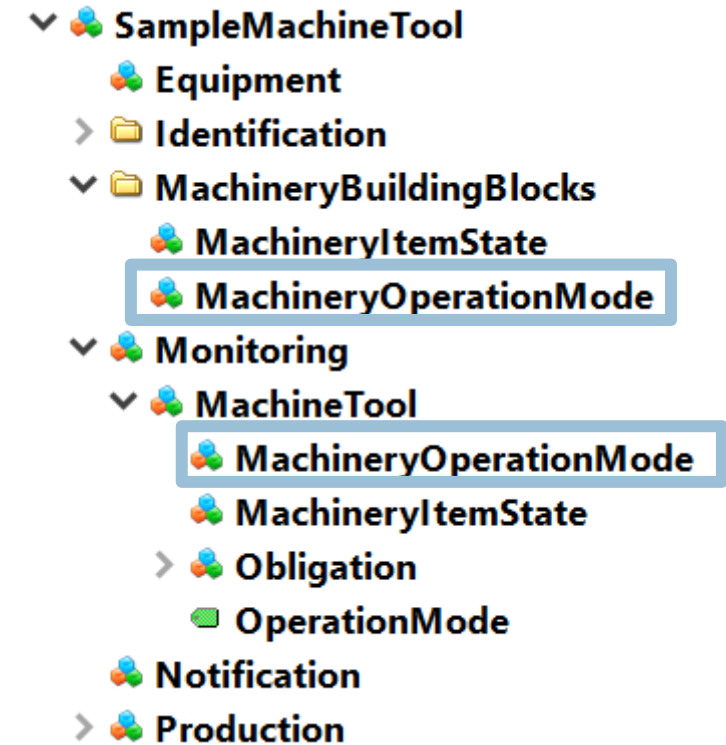
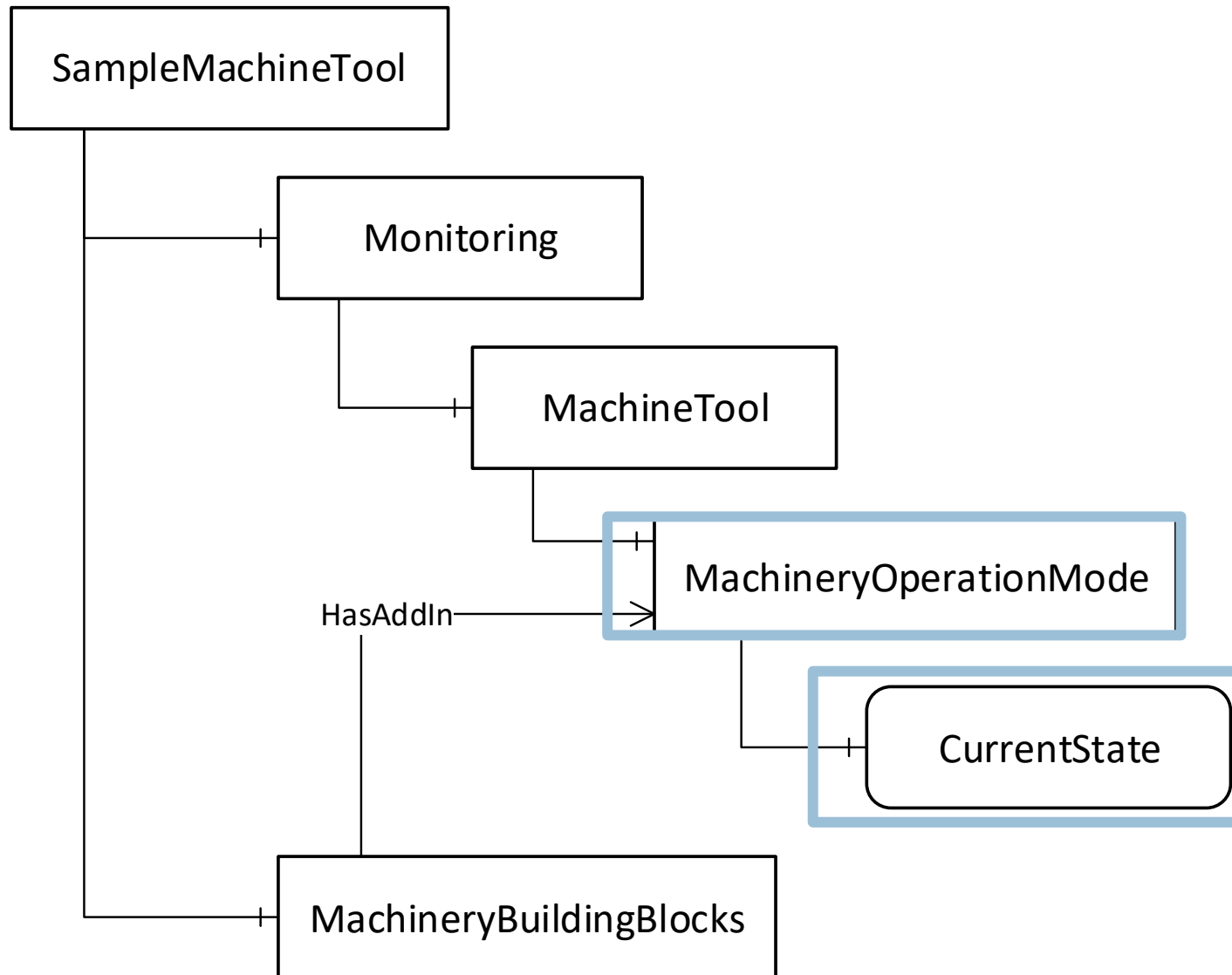
MachineryItemState



- ▼ SampleMachineTool
 - Equipment
 - > Identification
 - ▼ MachineryBuildingBlocks
 - MachineryItemState**
 - MachineryOperationMode
 - ▼ Monitoring
 - ▼ MachineTool
 - MachineryOperationMode
 - MachineryItemState**
 - > Obligation
 - OperationMode
 - Notification
 - > Production



MachineryOperationMode



Expected behaviour:

- The machine can only provide the time between the occurrence of an error and the machine being able to produce again.
- This can be given by the *OutOfService* state of the *MachineryItemState*

Description in Machinery Specification:

- The *OutOfService State* represents that the *MachineryItem* is not functional and does not perform any activity. Examples for this *State* are that the *Machine* is in an error or blocked.

Obligation

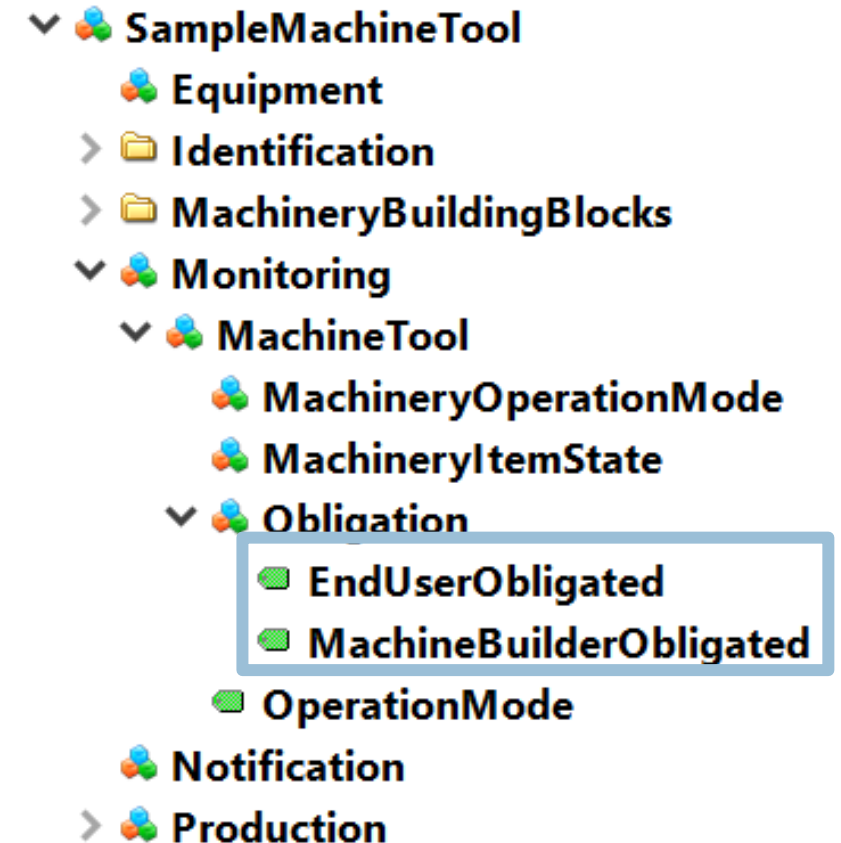


[new] EndUserObligated

EndUserObligated being True indicates that the machine tool's activity is the responsibility of the end user.

[new] MachineBuilderObligated

MachineBuilderObligated being True indicates that the machine tool's activity is the responsibility of the machine builder.



Efficiency ($\text{PartsProducedInLifetime} / \text{PartsCompleted}$)

Quality indicator (*PartsGood*)



[existing] *PartsProducedInLifetime*

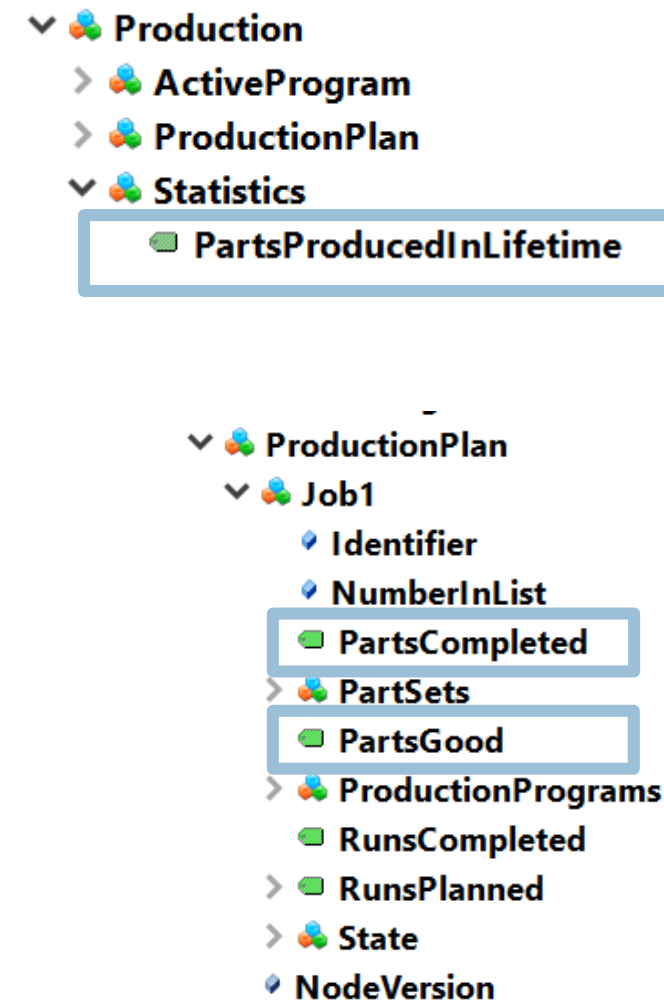
is the counter for the total number of produced parts during the machine tool's lifetime. exact way this number is acquired may differ between different machine tools. No qual information of *PartsProducedInLifetime* can be given.

[new] *PartsCompleted*

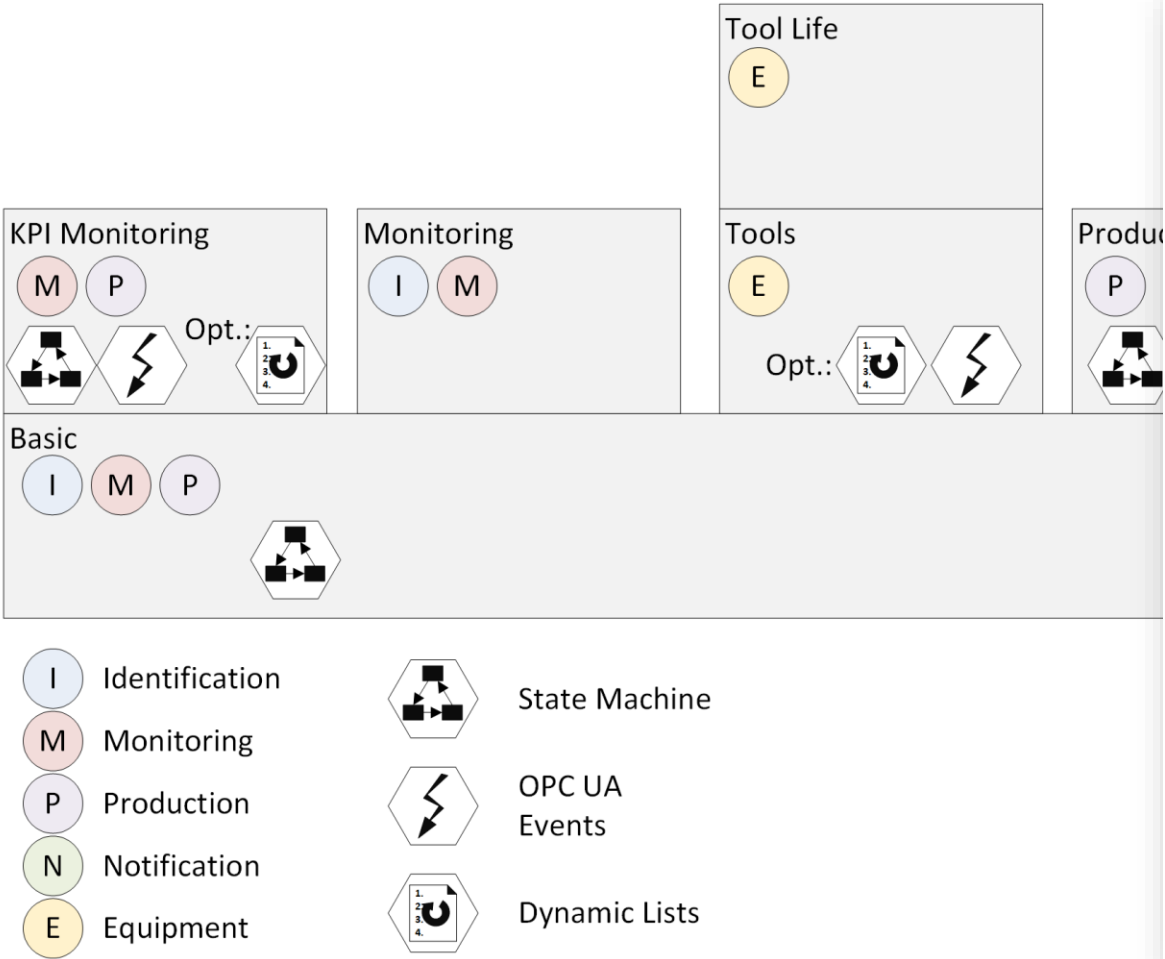
Indicates how many parts have been completed in the current job including all runs. This counter does not give any indication about the part quality. If *PartSets* are used, this counter shall be in sync with the respective *PartsCompletedPerRun* counter.

[new] *PartsGood*

Indicates how many good parts have been completed in the current job including all runs. A part is counted as long as there is no contradicting evidence. Note that such evidence may arise in subsequent processing steps, even if a part was counted as good. If individual *Parts* are modelled, this counter shall be identical to the number of *PartType Instances* with *PartQuality* set to *Good*, *CapabilityUnavailable* or *WillNotBeMeasured*.



- Sub-Element of *MachineryOperationMode*, as it is only valid if *MachineryOperationMode* is “Maintenance”
- Added Enum *MaintenanceMode* with Values
 - 0 Service
 - 1 Inspection
 - 2 Repair
 - 3 Upgrade
 - 4 Other
- Add Variable *MaintenanceMode* to Instance of *MachineryOperationMode* with *HasComponent*, optional



14.2.2.11 MachineTool KPI Monitoring Server Facet

This *Facet* provides values to aid KPI calculation.

Table 119 - MachineTool KPI Monitoring Server Facet

Group	ConformanceUnit / Profile Title	M / O
Profile	0:Address Space Notifier Server Facet	M
Profile	0:State Machine Server Facet	M
Machinery	3:Machinery State Server Facet	M
Machinery	3:Machinery Operation Mode	M
MachineTool	MachineTool Errors and Alerts Server Facet	M
MachineTool	MachineTool Monitoring Server Facet	M
MachineTool	MachineTool Production LastTransition	M
MachineTool	MachineTool Production ProductionJobStateMachineType	M
MachineTool	MachineTool Production ProductionProgramStateMachineType	M
MachineTool	MachineTool Production ProductionPartStateMachineType	M
MachineTool	MachineTool Production InterruptionConditionType	O
MachineTool	MachineTool Event Production	M
MachineTool	MachineTool Production Job Available	M
MachineTool	MachineTool Monitoring Obligation	M
MachineTool	MachineTool Production PartsProducedInLifetime	M
MachineTool	MachineTool Production Simple Parts Monitoring	M