

Business To Manufacturing   
Markup Language

Operations Capability

Version 0700

August 5, 2016

B2MML-OperationsCapability

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# Change history

|  |  |  |  |
| --- | --- | --- | --- |
| **Change** | **Date** | **Person** | **Description** |
| V0401 | Oct 2008 | Dennis Brandl | * Revised version number |
| V0500 | Mar 2011 | Dennis Brandl | * Initial version for ISA 95.02-2010 |
| V0600 | Aug 2012 | D. Brandl | Updated MESA Copyright |
| V0700 | Aug 2016 | D. Brandl | Updated version number only |

# Schema Scope

This document defines the information about capability by resource, and by process segment, that may be exchanged between business systems and manufacturing operations systems. This information is based on the data models and attributes defined in the ANSI/ISA 95.00.02 Enterprise/Control System Integration standard. Contact ISA (The Instrumentation, System, and Automation Society) for copies of the standard. Additional information on the standard is available at [www.isa.org](http://www.isa.org).

## Key Information Assumptions

The data represented in these schemas is derived from the UML model below. This model is defined in the ANSI/ISA 95.00.02 standard. The information model in the figure below is hierarchical, and the assumption is that any operations capability information will always be within a contained operations capability object.



Model of Exchanged Operations Capability Information

This schema uses a common schema for definition of elements that are used in multiple schemas, such as ID, Description, and Value. See the document defining the Common schema for definition of the common elements.

## Type Definitions

The XML schema uses a model that defines simple and complex data types for each element. The data types all follow the convention of a suffix of “Type” added to the element name. Elements that have the same name in other B2MML schemas are also prefixed with “**Op**” to uniquely identify the extension group.

Schema definition:

<xsd:element name = "**OpPersonnelCapability**" type = " **OpPersonnelCapabilityType**"/>

<xsd:complexType name = "**OpPersonnelCapabilityType**">

<xsd:sequence>

<xsd:element name = "PersonnelClassID" type = "PersonnelClassIDType"

minOccurs = "0" />

…

</xsd:complexType>

The method is a modification of the “Venetian Blind Model”, defined in the book Professional XML Schemas, 2001, published by WROX (ISBN 1-861005-47-4). It makes all of the type names global and usable in user derived works, without a loss of context or additional information required to identify the element as of being of the same type as related B2MML elements

## OperationsCapabilityInformation

An operations information element is a collection of OperationsCapability elements.

## OperationsCapability

An operations capability is the collection of information about all resources for production for selected times and within a selected site, area, process cell, production unit, or production line. This is made up of capability information about equipment, physical assets, material, personnel, and process segments. Operations capability also defines the available capability, committed capability, and unattainable capability of each resource, and each resource within a process segment.

## Personnel Capability

Personnel capability is defined as a set of references to persons or personnel classes which were used or unused, or are committed, available or unattainable, for a defined time. Personnel capability contains references to persons or personnel classes. Personnel capability identifies the capability type (available, unattainable, committed), and the time associated with the capability (e.g. third shift on a specific date).

Specific personnel capabilities are defined in personnel capability properties. The personnel capability property may include the quantity of the resource referenced, such as 3 horizontal drill press operators available for the third shift on February 29, 2012.

## EquipmentCapability

Equipment capability is defined as a set of references to equipment or equipment classes which were used or unused, or are committed, available or unattainable, for a defined time. Equipment capability contains references to equipment or equipment classes. Equipment capability will usually identify the capability type (available, unattainable, committed) and the time associated with the capability (e.g. third shift on a specific date).

Specific equipment capabilities are defined in equipment capability properties. The equipment capability properties may include the quantity of the resource referenced, such as 3 horizontal drill presses currently available.

## PhysicalAssetCapability

Physical asset capability is defined as a set of references to physical assets or physical asset classes which were used or unused, or are committed, available or unattainable, for a defined time. Physical asset capability contains references to physical assets or physical asset classes. Physical asset capability will usually identify the capability type (available, unattainable, committed) and the time associated with the capability (e.g. third shift on a specific date).

Specific physical asset capabilities are defined in physical asset capability properties. The equipment capability properties may include the quantity of the resource referenced.

## MaterialCapability

Material capability is defined as a set of references to material lots or sublots which were used or unused, or are committed, available or unattainable, for a defined time. Material capability identifies the capability type (available, unattainable, committed) and the time associated with the capability (e.g. third shift on a specific date).

Specific material capabilities are defined in material capability properties. The material capability properties may include the quantity of the material referenced.

## ProcessSegmentCapability

A process segment capability is defined as a logical grouping of personnel resources, equipment resources, physical asset resources and material which were used or unused, or are committed, available or unattainable, for a defined time for a specific process segment.

Process segment capability identifies the capability type (available, unattainable, committed), the time associated with the capability (e.g. third shift on a specific date).

## Resource Identification

The schemas follow the ANSI/ISA-95 standard by defining resources by class ID or instance ID, or by defining them by class ID and a property value that is used to define a subset of the resource. For example, the figure below illustrates that a segment may require a certain number of milling machine, an equipment class. Other segments may require a subset of milling machine, such as “Fine” milling machines only. In the first case the class name, “Mill”, is sufficient to identify the resource required. In the second case the class name, “Mill”, and property name and value, “Spec” and “Fine”, define the required resource. Alternately a specific resource may be specified for an operations capability, such as specifying milling machine with ID=”Miller#1”.



# Element Definitions

| **Element/Type** | **Description** |
| --- | --- |
| OperationsCapabilityInformation  ***OperationsCapabilityInformationType*** | Contains a collection of OperationsCapability elements. Contains an identification of the capability information, a description, the hierarchy scope in the role based equipment hierarchy, the published date of the information and a set of operations capability definitions. |
| OperationsCapability  ***OperationsCapabilityType*** | Contains a description of an operations capability, including the hierarchy scope of the capability, the published date of the capability, the reason for the capability, the time range of the capability, the equipment, physical assets, material, and personnel resources for the capability, and process segment capabilities within the operations capability. |
| EquipmentCapability  ***OpEquipmentCapabilityType*** | Contains a definition of an equipment capability. Including the type of the capability, the hierarchy scope of the capability, the time duration of the capability, the quantity of the capability, and the properties that may be required to identify capabilities of subsets of the class. |
| EquipmentCapabilityProperty  ***OpEquipmentCapabilityPropertyType*** | Contains a definition of the quantity of an equipment property, including the value used to identify the class subset of the capability, and the quantity of the capability. |
| MaterialCapability  ***OpMaterialCapabilityType*** | Contains a definition of a material capability. Including the type of the capability, the hierarchy scope of the capability, the time duration of the capability, the quantity of the capability, the use of the material (consumed or produced), any contained material assembly capability definitions, and the properties that may be required to identify capabilities of subsets of the class. |
| MaterialCapabilityProperty  ***OpMaterialCapabilityPropertyType*** | Contains a definition of the quantity of a material property, including the value used to identify the class subset of the capability, the use of the material in the capability, and the quantity of the capability. |
| PersonnelCapability  ***OpPersonnelCapabilityType*** | Contains a definition of a personnel capability. Including the type of the capability, the hierarchy scope of the capability, the time duration of the capability, the quantity of the capability, and the properties that may be required to identify capabilities of subsets of the class. |
| PersonnelCapabilityProperty  ***OpPersonnelCapabilityPropertyType*** | Contains a definition of the quantity of a personnel property, including the value used to identify the class subset of the capability, and the quantity of the capability. |
| PhysicalAssetCapability  ***OpPhysicalAssetCapabilityType*** | Contains a definition of a physical asset capability. Including the type of the capability, the hierarchy scope of the capability, the time duration of the capability, the quantity of the capability, and the properties that may be required to identify capabilities of subsets of the class. |
| PhysicalAssetCapabilityProperty  ***OpPhysicalAssetCapabilityPropertyType*** | Contains a definition of the quantity of a physical asset property, including the value used to identify the class subset of the capability, and the quantity of the capability. |
| ProcessSegmentCapability  ***OpProcessSegmentCapabilityType*** | Contains a definition of a capability for a process segment, includes the identification of the associated process segment, the capability type, the reason for the capability, the location of the capability, the duration of the capability, the personnel, equipment, and material capability definitions, and any encapsulated process segment capabilities. |

# Transaction Elements

The following elements are defined to support the ISA 95 Part 5 transactions, using the transaction data types defined in the B2MML-Common.xsd schema.

| **Operations Capability Information Elements** | **Description** |
| --- | --- |
| GetOperationsCapabilityInformation | Get an *OperationsCapabilityInformation* definition. |
| ShowOperationsCapabilityInformation | Returned information from the *GetOperationsCapabilityInformation* message. |
| ProcessOperationsCapabilityInformation | Process an *OperationsCapabilityInformation* definition. |
| AcknowledgeOperationsCapabilityInformation | Returned status from the *ProcessOperationsCapabilityInformation* message. |
| ChangeOperationsCapabilityInformation | Change an *OperationsCapabilityInformation* definition. |
| RespondOperationsCapabilityInformation | Returned status from the *ChangeOperationsCapabilityInformation* message. |
| CancelOperationsCapabilityInformation | Cancel an *OperationsCapabilityInformation* definition. |
| SyncOperationsCapabilityInformation | Published *OperationsCapabilityInformation* definition. |

|  |  |
| --- | --- |
| **Operations Capability Elements** | **Description** |
| GetOperationsCapability | Get an *OperationsCapability* definition. |
| ShowOperationsCapability | Returned information from the *GetOperationsCapability* message. |
| ProcessOperationsCapability | Process an *OperationsCapability* definition. |
| AcknowledgeOperationsCapability | Returned status from the *ProcessOperationsCapability* message. |
| ChangeOperationsCapability | Change an *OperationsCapability* definition. |
| RespondOperationsCapability | Returned status from the *ChangeOperationsCapability* message. |
| CancelOperationsCapability | Cancel an *OperationsCapability* definition. |
| SyncOperationsCapability | Published *OperationsCapability* definition. |

# Diagram Convention

The schema diagrams using the following convention to illustrate the structure of the schema elements, the type of the elements and attributes, and the rules for optional elements and repetition.



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About the XML Committee: The XML Committe was formed within MESA to provide a forum for the development of the B2MML and BatchML specifications.