Business To Manufacturing Markup Language

B2MML – Operations Capability

Version 0500 – March 2011

Operations Capability Schema Documentation

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Change History:

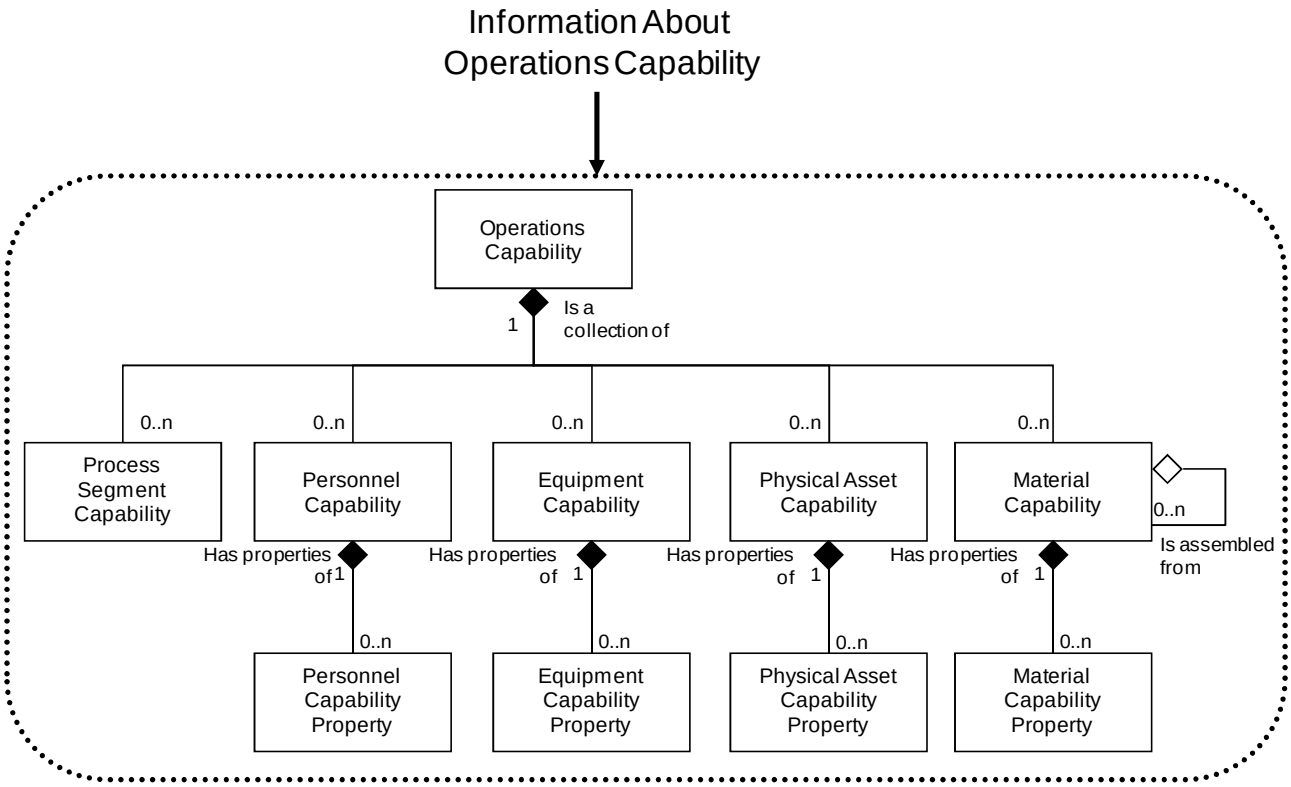
Change	Date	Person	Description
V0401	Oct 2008	Dennis Brandl	• Revised version number
V0500	Mar 2011	Dennis Brandl	• Initial version for ISA 95.02-2010

1 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.

1.1 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.

1.2 Key Use Assumptions

The model only defines the exchanged information and does not define the use of the information or encapsulation of the information in any defining transactions.

1.3 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

1.4 OperationsInformation

An operations information element is a collection of OperationsCapability elements.

1.5 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, material, personnel, and process segments. It describes the names, terms, status, and quantities of which the manufacturing control system has knowledge. Operations capability also defines the available capability, committed capability, and unattainable capability of each resource, and each resource within a process segment.

1.6 Personnel Capability

Personnel capability is defined as a set of references to persons or personnel classes 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.

1.7 EquipmentCapability

Equipment capability is defined as a set of references to equipment or equipment classes committed, available, or unavailable 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.

1.8 PhysicalAssetCapability

Physical asset capability is defined as a set of references to physical assets or physical asset classes committed, available, or unavailable 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.

1.9 MaterialCapability

Material capability is defined as a set of references to material lots or sublots committed, available, or unavailable 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.

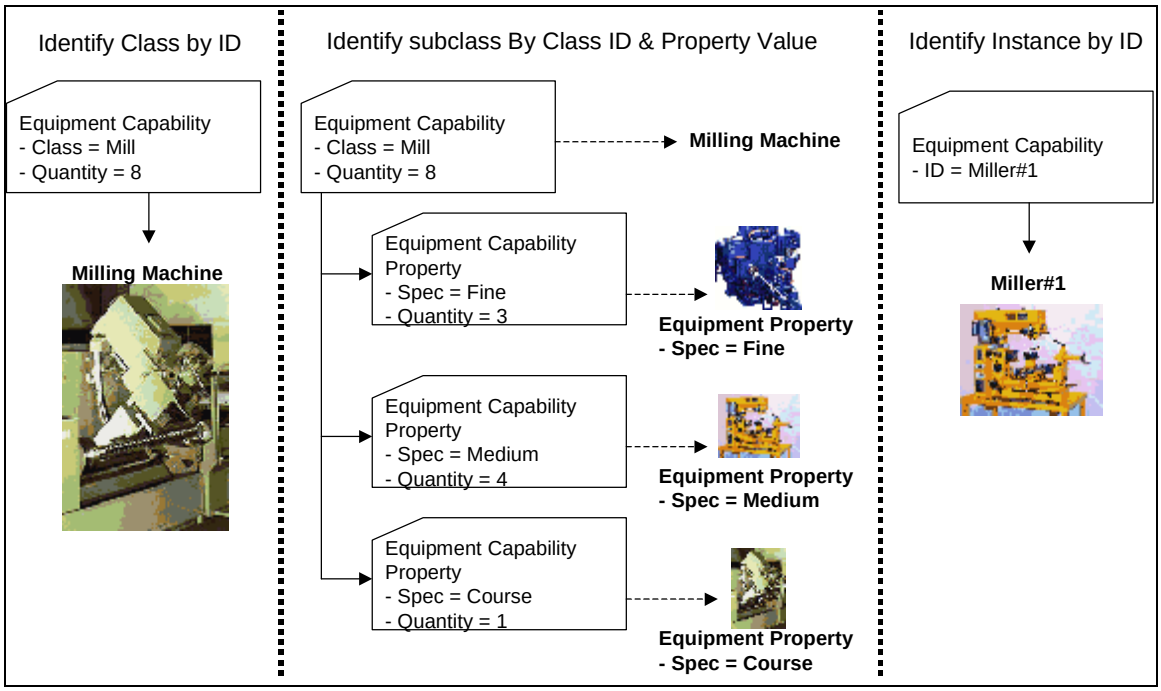
1.10 ProcessSegmentCapability

A process segment capability is defined as a logical grouping of personnel resources, equipment resources, physical asset resources and material that is committed, available, or unavailable for a defined process segment for a specific time.

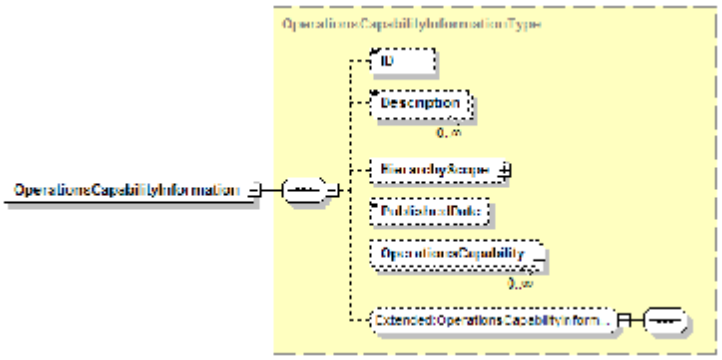
Process segment capability identifies the capability type (available, unattainable, committed), the time associated with the capability (e.g. third shift on a specific date).

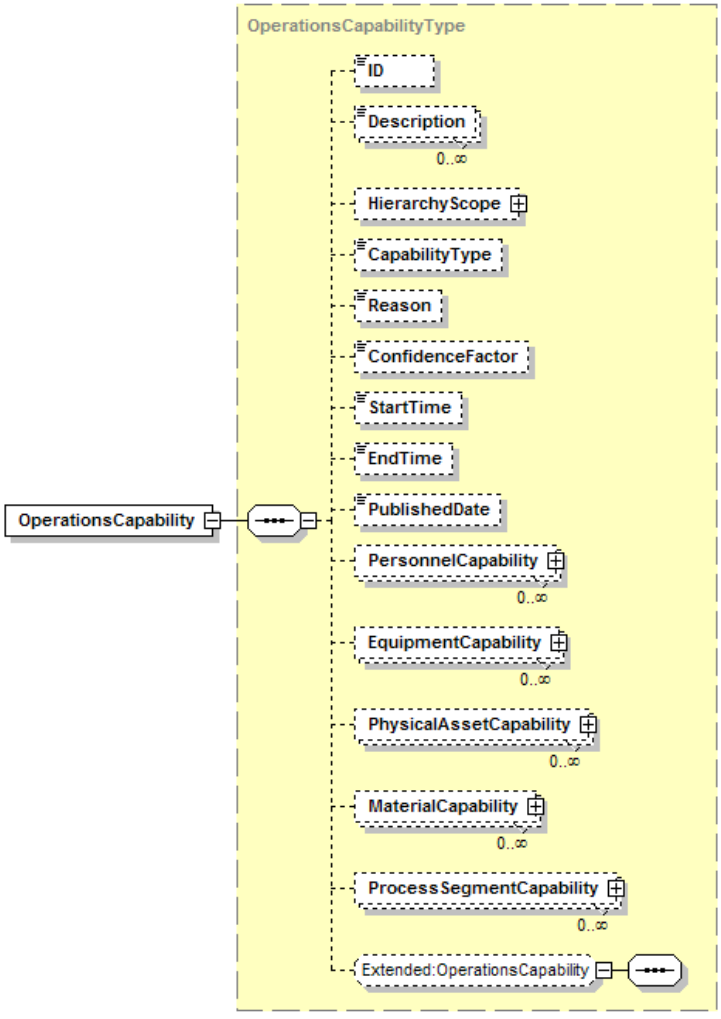
1.11 Resource Identification

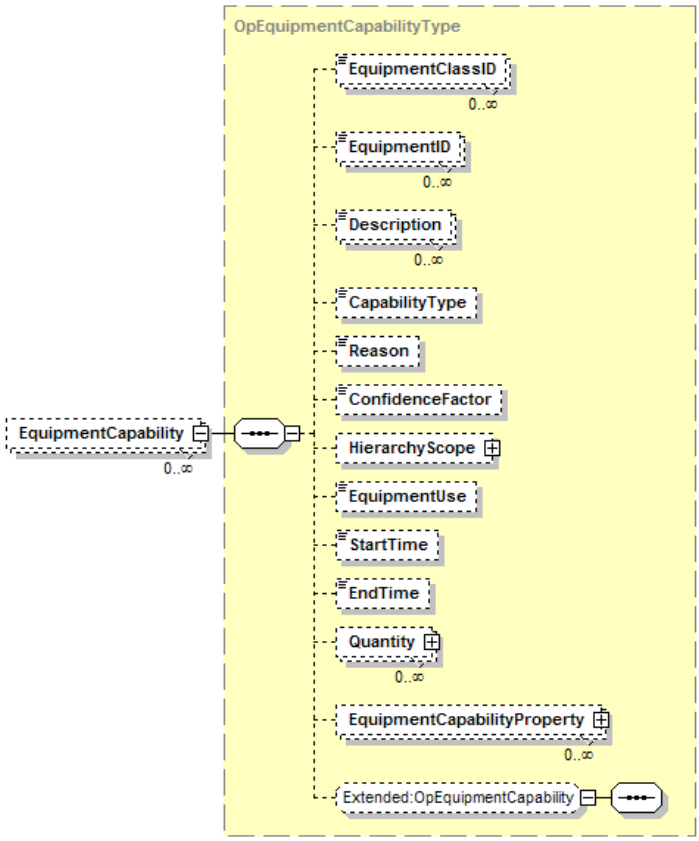
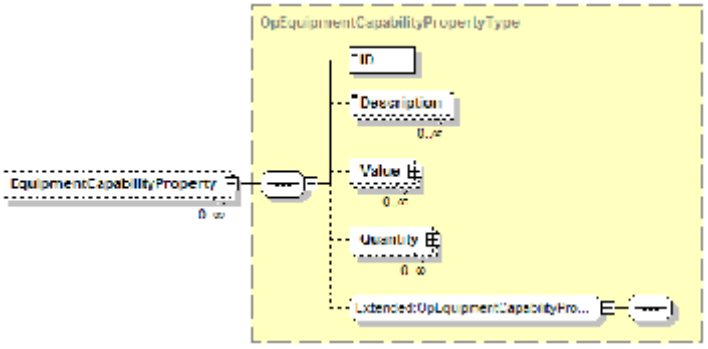
The schemas follow the ANSI/ISA-95 standard by defining resources by class ID or instance ID, or by defining them by class ID and a property value that is used to define a subset of the resource. For example, the figure below illustrates that a segment may require a certain number of milling machine, 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 a operations capability, such as specifying milling machine with ID=”Miller#1”.

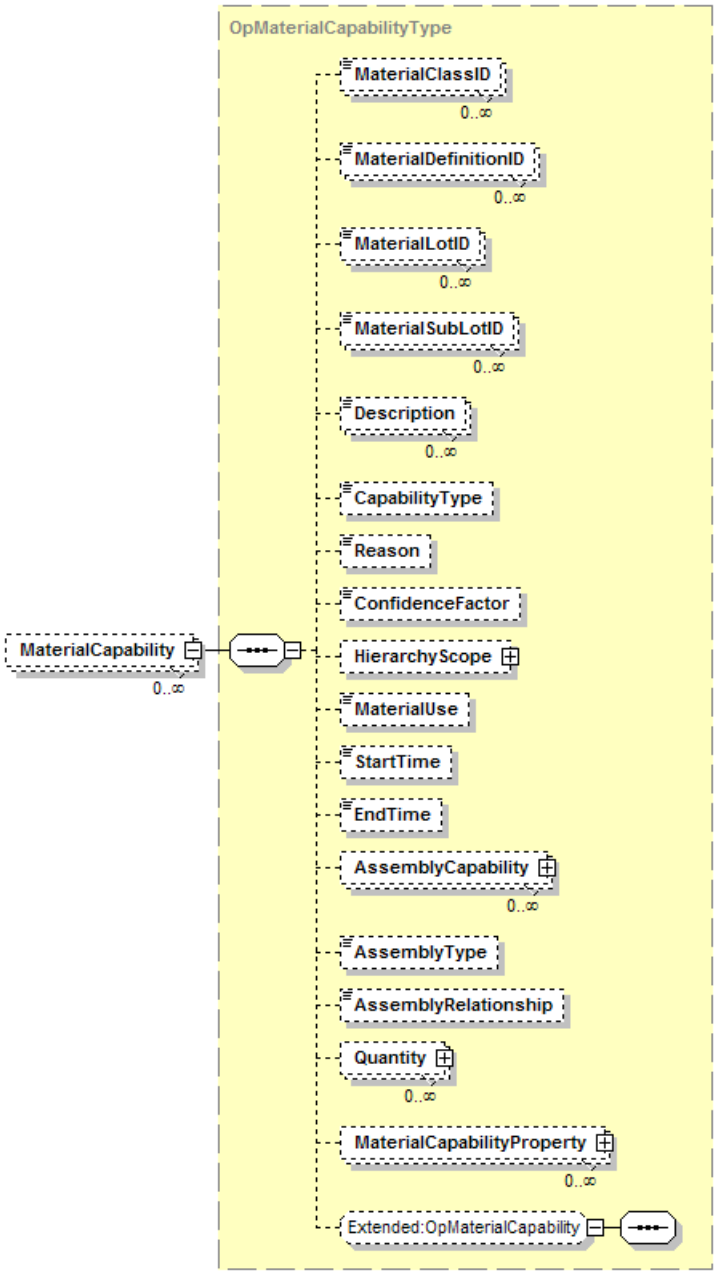


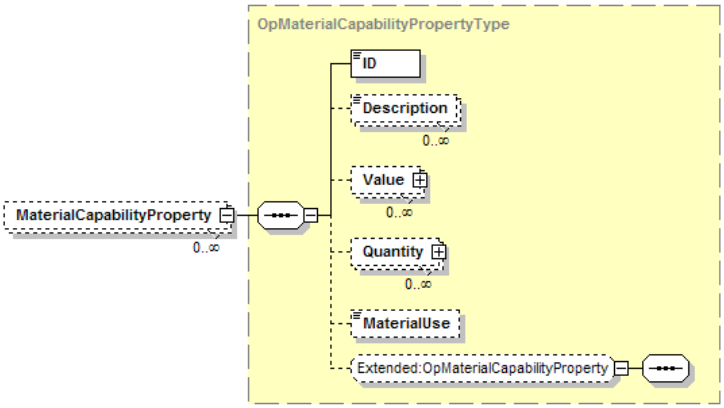
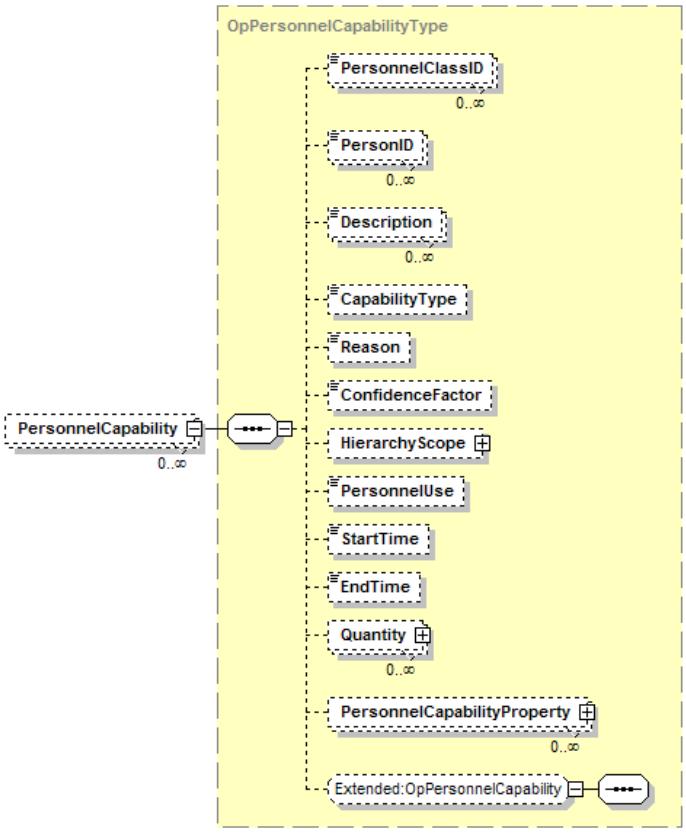
2 Element Definitions

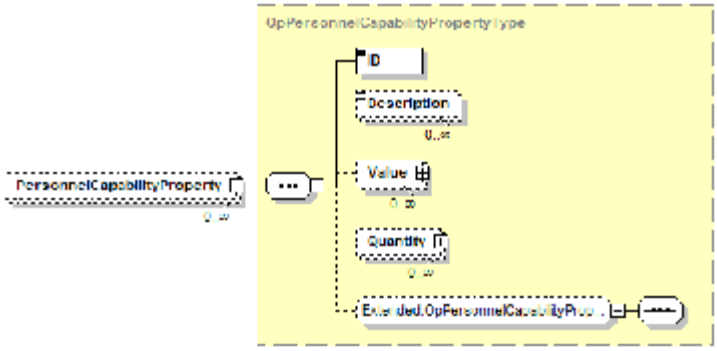
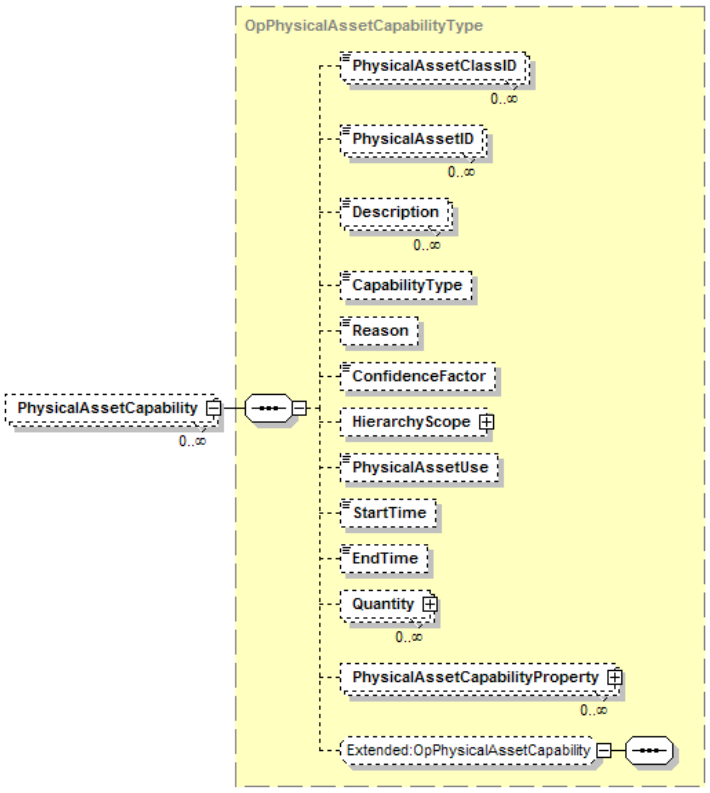
Element/Type	Description
OperationsCapabilityInformation ***OperationsCapabilityInformationType***	Contains a collection of OperationsCapability elements. Contains an identification of the capability definitions, a description, the hierarchy scope in the role based equipment hierarchy, the published date of the information and a set of operations capability definitions. 

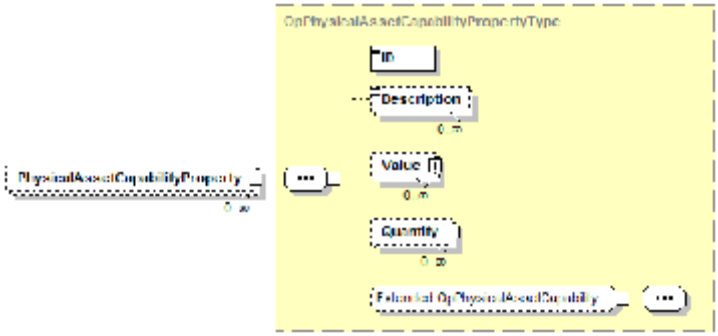
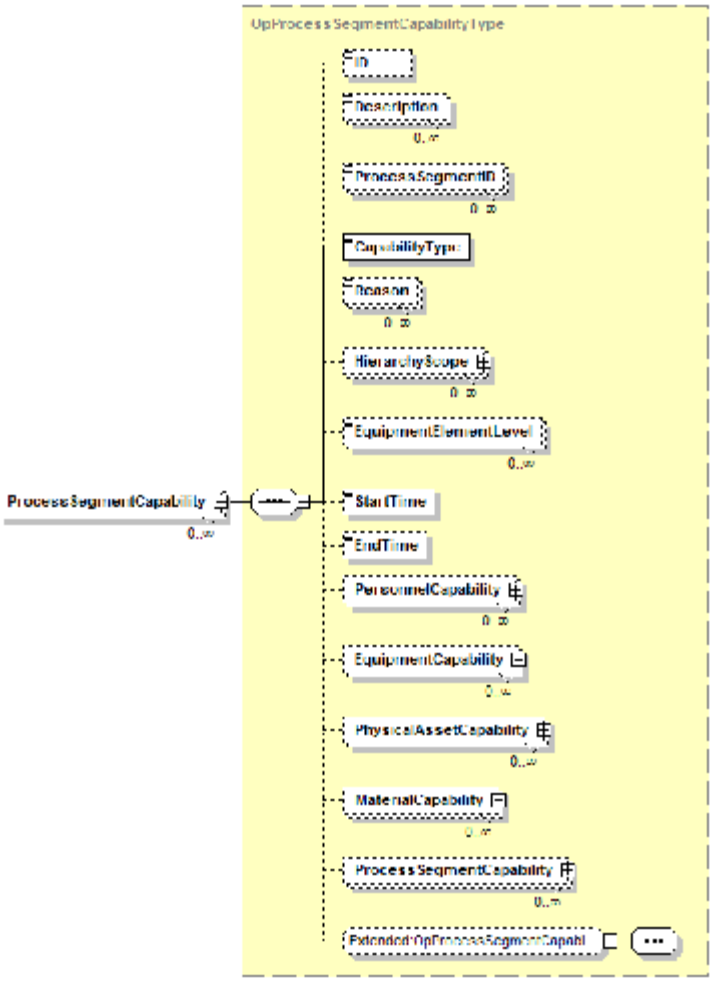
Element/Type	Description
OperationsCapability ***OperationsCapabilityType***	Contains a description of an operations capability, including the location of the capability, the published date of the capability, the reason for the capability, the time range of the capability, the equipment, material, and personnel resources for the capability, and process segment capabilities within the operations capability. May also include application defined extension elements. 

Element/Type	Description
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. 

Element/Type	Description
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. 

Element/Type	Description
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. 

Element/Type	Description
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. 

Element/Type	Description
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. May also include application defined elements. 

3 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 capabilityElements	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.
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.

4 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.