Abstract:

OASIS PPS (Production Planning and Scheduling) specifications deal with problems of decision-making in all manufacturing companies who want to have a sophisticated information system for production planning and scheduling. PPS specifications provide XML schema and communication protocols for information exchange among manufacturing application programs in the web-services environment. Part 1: Core Element especially focuses on information model of core elements which can be used as ontology in the production planning and scheduling domain. Since the elements have been designed without particular contexts in planning and scheduling, they can be used in any specific type of messages as a building block depending on the context of application programs.
**Status:**

This document was last revised or approved by the PPS TC on the above date. The level of approval is also listed above. Check the “Latest Version” or “Latest Approved Version” location noted above for possible later revisions of this document.

Technical Committee members should send comments on this specification to the Technical Committee’s email list. Others should send comments to the Technical Committee by using the “Send A Comment” button on the Technical Committee’s web page at http://www.oasis-open.org/committees/pps/.

For information on whether any patents have been disclosed that may be essential to implementing this specification, and any offers of patent licensing terms, please refer to the Intellectual Property Rights section of the Technical Committee web page (http://www.oasis-open.org/committees/pps/ipr.php).

The non-normative errata page for this specification is located at http://www.oasis-open.org/committees/pps/.
Notices

Copyright © OASIS® 2007. All Rights Reserved.

All capitalized terms in the following text have the meanings assigned to them in the OASIS Intellectual Property Rights Policy (the "OASIS IPR Policy"). The full Policy may be found at the OASIS website.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published, and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this section are included on all such copies and derivative works. However, this document itself may not be modified in any way, including by removing the copyright notice or references to OASIS, except as needed for the purpose of developing any document or deliverable produced by an OASIS Technical Committee (in which case the rules applicable to copyrights, as set forth in the OASIS IPR Policy, must be followed) or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by OASIS or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and OASIS DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY OWNERSHIP RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

OASIS requests that any OASIS Party or any other party that believes it has patent claims that would necessarily be infringed by implementations of this OASIS Committee Specification or OASIS Standard, to notify OASIS TC Administrator and provide an indication of its willingness to grant patent licenses to such patent claims in a manner consistent with the IPR Mode of the OASIS Technical Committee that produced this specification.

OASIS invites any party to contact the OASIS TC Administrator if it is aware of a claim of ownership of any patent claims that would necessarily be infringed by implementations of this specification by a patent holder that is not willing to provide a license to such patent claims in a manner consistent with the IPR Mode of the OASIS Technical Committee that produced this specification. OASIS may include such claims on its website, but disclaims any obligation to do so.

OASIS takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on OASIS’ procedures with respect to rights in any document or deliverable produced by an OASIS Technical Committee can be found on the OASIS website. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this OASIS Committee Specification or OASIS Standard, can be obtained from the OASIS TC Administrator. OASIS makes no representation that any information or list of intellectual property rights will at any time be complete, or that any claims in such list are, in fact, Essential Claims.

The names "OASIS", PPS are trademarks of OASIS, the owner and developer of this specification, and should be used only to refer to the organization and its official outputs. OASIS welcomes reference to, and implementation and use of, specifications, while reserving the right to enforce its marks against misleading uses. Please see http://www.oasis-open.org/who/trademark.php for above guidance.
# Table of Contents

1. **Introduction** .......................................................................................................................... 6
  1.1 **Terminology** ......................................................................................................................... 6
  1.2 **Normative References** ......................................................................................................... 6
  1.3 **Non-Normative References** ................................................................................................. 6
  1.4 **Conformance** ....................................................................................................................... 6
  1.5 **Terms and definitions** ........................................................................................................... 7
2. **Primitive Elements** .................................................................................................................... 8
  2.1 **Structure of primitive elements** ............................................................................................ 8
  2.2 **List of primitive elements** ..................................................................................................... 9
  2.2.1 **Party element** .................................................................................................................... 9
  2.2.2 **Plan element** ...................................................................................................................... 10
  2.2.3 **Order element** .................................................................................................................... 10
  2.2.4 **Item element** ..................................................................................................................... 10
  2.2.5 **Resource element** .............................................................................................................. 10
  2.2.6 **Process element** ............................................................................................................... 11
  2.2.7 **Lot element** ...................................................................................................................... 11
  2.2.8 **Task element** .................................................................................................................... 11
  2.2.9 **Operation element** ........................................................................................................... 11
3. **Relational Elements** ............................................................................................................... 12
  3.1 **Structure of relational elements** ........................................................................................ 12
  3.2 **List of relational elements** .................................................................................................. 13
  3.2.1 **Compose element** ............................................................................................................ 13
  3.2.2 **Produce element** ............................................................................................................... 14
  3.2.3 **Consume element** ............................................................................................................ 14
  3.2.4 **Assign element** ............................................................................................................... 14
  3.2.5 **Relation element** ............................................................................................................. 14
4. **Specific Elements** .................................................................................................................. 15
  4.1 **Structure of specific element** .............................................................................................. 15
  4.2 **List of specific elements** ..................................................................................................... 16
  4.2.1 **Location element** .............................................................................................................. 16
  4.2.2 **Capacity element** ............................................................................................................. 16
  4.2.3 **Progress element** ............................................................................................................. 17
  4.2.4 **Spec element** ................................................................................................................... 17
5. **Eventual Elements** ................................................................................................................. 18
  5.1 **Structure of eventual element** ............................................................................................ 18
  5.2 **List of eventual elements** .................................................................................................... 19
  5.2.1 **Start element** .................................................................................................................... 19
  5.2.2 **End element** ..................................................................................................................... 19
  5.2.3 **Event element** .................................................................................................................. 19
6. **Accounting Elements** ............................................................................................................ 20
  6.1 **Structure of Accounting element** ...................................................................................... 20
  6.2 **List of accounting elements** .............................................................................................. 21
  6.2.1 **Price element** .................................................................................................................. 21
6.2.2 Cost element ............................................................................................................................. 21
7 Administrative Elements .................................................................................................................. 22
  7.1 Structure of Administrative Elements .......................................................................................... 22
  7.2 List of Administrative Elements .................................................................................................. 22
    7.2.1 Priority element ....................................................................................................................... 23
    7.2.2 Display element ....................................................................................................................... 23
    7.2.3 Description element ............................................................................................................... 23
    7.2.4 Author element ....................................................................................................................... 23
    7.2.5 Date element ......................................................................................................................... 23
8 Data Elements .................................................................................................................................. 24
  8.1 Qty element ................................................................................................................................. 24
  8.2 Char element ............................................................................................................................... 24
  8.3 Time element ............................................................................................................................... 25
A. Object Class diagram ..................................................................................................................... 27
B. Cross reference of elements ........................................................................................................... 28
C. Acknowledgements ....................................................................................................................... 30
D. Revision History ............................................................................................................................ 31
1 Introduction

This document prescribes how to describe contents of the XML messages which are used for exchanging the information on Production Planning and Scheduling by some application software programs.

If information is exchanged between production planning and scheduling applications, the enterprise can develop systems comparatively easily at a low cost and make them more competitive for the whole enterprise. To make matters better, the systems will be able to have high extendability in future.

This specification aims at production planning and scheduling for all kinds of products and services provided by manufacturing enterprises. Production scheduling explained in this specification can be divided into scheduling in the whole enterprise including some areas and sites, and detailed scheduling within an individual area and work-centers.

The scope of this specification doesn’t include optimization logic for solution, special knowledge of individual enterprises, concrete solution methods for production planning and scheduling, and planning for the total supply chain.

1.1 Terminology

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

1.2 Normative References


1.3 Non-Normative References


1.4 Conformance

A document or part of document confirms OASIS PPS Core Elements if all elements in the artifact are consistent with the normative text of this specification, and the document can be processed properly with the XML schema that can be downloaded from the following URI.

http://docs.oasis-open.org/pps/v1.0/pps-schema-1.0.xsd

PPS Part 1: Core Elements, Version 1.0
Copyright © OASIS® 2007-2009. All Rights Reserved.
1.5 Terms and definitions

Plan
Unit for intensive information of related orders corresponding to a specific period on a discrete
time scale, or calculated information based on the schedule under the related orders. This can
represent actual results when the related events have been occurred.

Order
Unit of requirement describing concrete item, resource or operation in a specific place at a
specific time. This can also represent the results to the requirement.

Party
Customer who is a sender of an order and has a demand to make a decision, or supplier who is a
receiver in case that a decision-maker sends the demand that can’t be handled inside.

Item
Object to be produced or consumed by production activities. The quantity or the quality of item is
changed during the production activity. Examples include product, parts, module, unit, work in
process and materials.

Resource
Object that can provide essential function for production activities. The capacity of function is
used during production activity, and is available again after finishing the production. Examples
include equipment, machine, device, labor and tool.

Process
Segment of production activities indicating a certain production line or method. This takes
duration from start time to end time, and gives added value to the producing item. One process
may have two or more than two processes detailed in the lower levels.

Lot
Instance of a specific volume of item that exists in a specific place at a specific time. Generally
the specific time corresponds to start or end of an operation, and the specific volume is equal to
the quantity of item produced or consumed by the operation.

Task
Unit of necessity to execute a specific operation at a specific time, indicating the volume of used
capability provided by the applicable resource. This can represent both capacity value provided
by resource at a specific time point, and aggregated total value of capacity provided by resource
during specific duration.

Operation
Actual processing element to be executed by a specific task, and to produce or consume a
specific lot. It is a concrete instance of particular processes in production activities.
2 Primitive Elements

2.1 Structure of primitive elements

Primitive elements are the minimum series of element that corresponds to the most basic domain objects. The type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following constraints.

```
<xsd:complexType name="PrimitiveType">
  <xsd:sequence>
    <xsd:element ref="Compose" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Produce" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Consume" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Assign" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Relation" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Location" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Capacity" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Progress" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Spec" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Start" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="End" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Event" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Cost" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Priority" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Display" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Description" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Author" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Date" minOccurs="0" maxOccurs="unbounded"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="xsd:string" use="required"/>
  <xsd:attribute name="key" type="xsd:long"/>
  <xsd:attribute name="name" type="xsd:string"/>
  <xsd:attribute name="parent" type="xsd:string"/>
  <xsd:attribute name="type" type="xsd:string"/>
  <xsd:attribute name="status" type="xsd:string"/>
  <xsd:attribute name="party" type="xsd:string"/>
  <xsd:attribute name="plan" type="xsd:string"/>
  <xsd:attribute name="order" type="xsd:string"/>
  <xsd:attribute name="item" type="xsd:string"/>
  <xsd:attribute name="resource" type="xsd:string"/>
  <xsd:attribute name="process" type="xsd:string"/>
  <xsd:attribute name="lot" type="xsd:string"/>
  <xsd:attribute name="task" type="xsd:string"/>
  <xsd:attribute name="operation" type="xsd:string"/>
</xsd:complexType>
```

- `id` attribute SHOULD represent an identifier of this element.
- `key` attribute SHOULD represent a key used in the local applications.
- `name` attribute SHOULD represent the name of this element.
- `parent` attribute SHOULD represent the identifier of the inherited element of this element.
- `type` attribute SHOULD represent the division of this element.
- `status` attribute SHOULD represent the status of this element.
- `party` attribute SHOULD represent an identifier of the party associated with this element.
- `plan` attribute SHOULD represent the identifier of the plan associated with this element.
- `order` attribute SHOULD represent the identifier of the order associated with this element.
2.2 List of primitive elements

This specification defines nine primitive elements: Party, Plan, Order, Item, Resource, Process, Lot, Task, and Operation. The type of those elements SHOULD be represented with the following XML schema.

```xml
<xsd:element name="Party" type="PrimitiveType"/>
<xsd:element name="Plan" type="PrimitiveType"/>
<xsd:element name="Order" type="PrimitiveType"/>
<xsd:element name="Item" type="PrimitiveType"/>
<xsd:element name="Resource" type="PrimitiveType"/>
<xsd:element name="Process" type="PrimitiveType"/>
<xsd:element name="Lot" type="PrimitiveType"/>
<xsd:element name="Task" type="PrimitiveType"/>
<xsd:element name="Operation" type="PrimitiveType"/>
```

2.2.1 Party element

Party element represents a customer or a supplier. Customer is an object that requests some products or services to the enterprise. The requests are sent to a person who is in charge of production planning and
scheduling. Supplier is an object providing some products or services to the enterprise. Supplier receives orders form the enterprise, and provides corresponding items, resources or processes for the enterprise.

### 2.2.2 Plan element

*Plan element* represents a value planned for particular products or services. The value shows volume of the products or services required or resulted during certain period of time. Typical cases of planning period include day, week and month.

### 2.2.3 Order element

*Order element* represents an object of information produced to request some products or services. Order is source to create production orders that are finally dispatched to the plant floor. Orders can be divided into inventory order, capacity order and production order according to the type of request.

Example: Ten “A” products are requested.

```xml
<Order id="Z01" item="A">
  <Spec type="quantity"><Qty value="10"/></Spec>
</Order>
```

Example: Three labors in group “B” are requested.

```xml
<Order id="Z02" resource="groupB">
  <Spec type="quantity"><Qty value="3"/></Spec>
</Order>
```

Example: Switching operation is requested two times.

```xml
<Order id="Z03" process="change01">
  <Spec type="quantity"><Qty value="2"/></Spec>
</Order>
```

Example: Order which consist of 10 of “A” and 5 of “B” is totally 3,000 yen.

```xml
<Order id="Z00">
  <Compose order="Z01"/>
  <Compose order="Z02"/>
  <Price value="3000" unit="yen"/>
</Order>
```

### 2.2.4 Item element

*Item element* represents a product, component, parts, work in process (WIP), raw material and other items. Item is produced by any processes, and after that, it is consumed by another processes. Lot is an instance of the corresponding item.

### 2.2.5 Resource element

*Resource element* represents a resource, which is an object enabling production, transportation, storage, inspection and other various services. As resource can produce tasks to execute operations, it is assigned to an operation by considering its volume of capacity.
2.2.6 Process element

Process element represents a process that has a function to produce value. Process can be defined as a segment of activities in production process. It produces and consumes production items by being executed during certain period of time.

2.2.7 Lot element

Lot element represents a production lot. Production lot is an object corresponding to a concrete item that actually exists in a specific place at a specific date and time. Lot is produced by an operation and finally consumed by another operation or discarded.

2.2.8 Task element

Task element represents a task, which is an object showing the usage of a specific resource capability for a specific period of time. Schedule may request a certain volume of task for each resource assigned to execute the appropriate operations.

Example: Task corresponding to the volume that 3 labors work load is required for 2 days

```xml
<Task id="T01">
  <Capacity type="human"><Qty value="3"/></Capacity>
  <Capacity type="duration"><Qty value="2" unit="day"/></Capacity>
</Task>
```

2.2.9 Operation element

Operation element represents a segment of activities that is actually dispatched to plant floor. Operation identifies an executable function at a specific place on a plant floor for a specific time. Operation is associated with a specific lot and task by executing those activities.
3 Relational Elements

3.1 Structure of relational elements

Relational elements represent any relations between primitive elements. A relational element can have properties. The type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following constraints.

```xml
<xsd:complexType name="RelationalType">
  <xsd:sequence>
    <xsd:element ref="Location" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Capacity" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Progress" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Spec" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Start" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="End" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Event" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Price" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Cost" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Priority" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Display" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Description" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Date" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Qty" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Char" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Time" minOccurs="0" maxOccurs="unbounded"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="xsd:string"/>
  <xsd:attribute name="key" type="xsd:long"/>
  <xsd:attribute name="name" type="xsd:string"/>
  <xsd:attribute name="type" type="xsd:string"/>
  <xsd:attribute name="status" type="xsd:string"/>
  <xsd:attribute name="apply" type="xsd:string"/>
  <xsd:attribute name="party" type="xsd:string"/>
  <xsd:attribute name="plan" type="xsd:string"/>
  <xsd:attribute name="order" type="xsd:string"/>
  <xsd:attribute name="item" type="xsd:string"/>
  <xsd:attribute name="resource" type="xsd:string"/>
  <xsd:attribute name="process" type="xsd:string"/>
  <xsd:attribute name="lot" type="xsd:string"/>
  <xsd:attribute name="task" type="xsd:string"/>
  <xsd:attribute name="operation" type="xsd:string"/>
</xsd:complexType>
```

- **id** attribute SHOULD represent an identifier of this element.
- **key** attribute SHOULD represent a key used in the local applications.
- **name** attribute SHOULD represent the name of this element.
- **type** attribute SHOULD represent the division of this element.
- **status** attribute SHOULD represent the status of this element.
- **apply** attribute SHOULD represent application type of this element. This element is a disjunctive (OR) content under the parent element, if the attribute value is "disjunctive".
- **party** attribute SHOULD represent an identifier of the party associated with this element.
- **plan** attribute SHOULD represent the identifier of the plan associated with this element.
- **order** attribute SHOULD represent the identifier of the order associated with this element.
295 • *item* attribute SHOULD represent the identifier of the item associated with this element.
296 • *resource* attribute SHOULD represent the identifier of the resource associated with this element.
297 • *process* attribute SHOULD represent the identifier of the process associated with this element.
298 • *lot* attribute SHOULD represent the identifier of the lot associated with this element.
299 • *task* attribute SHOULD represent the identifier of the task associated with this element.
300 • *operation* attribute SHOULD represent the identifier of the operation associated with this element.
301 • *Location* element SHOULD represent the location associated with this element.
302 • *Capacity* element SHOULD represent the capacity status of this element.
303 • *Progress* element SHOULD represent the progress of this element.
304 • *Spec* element SHOULD represent the specification of this element.
305 • *Start* element SHOULD represent the start event of this element.
306 • *End* element SHOULD represent the completion event of this element.
307 • *Event* element SHOULD represent the optional event under this element.
308 • *Price* element SHOULD represent the price of this element.
309 • *Cost* element SHOULD represent the cost of this element.
310 • *Priority* element SHOULD represent the priority of this element.
311 • *Display* element SHOULD represent how to display this element.
312 • *Description* element SHOULD represent the description of this element.
313 • *Author* element SHOULD represent the author of this element information.
314 • *Date* element SHOULD represent the date of this element information.
315 • *Qty* element SHOULD represent the quantity of this element.
316 • *Char* element SHOULD represent the qualitative value of this element.
317 • *Time* element SHOULD represent the time of this element.
318
319
320 3.2 List of relational elements
321 This part of specifications defines five relational elements: *Compose, Produce, Consume, Assign,* and 322 *Relation*. Relational element defines relationship between the parent element and those that characterize 323 the element. The type of this element SHOULD be represented with the following XML schema.
324
325 326
327
328
329
330
331 3.2.1 Compose element
332 *Compose* element defines a hierarchical relation between the parent element and another same primitive 333 element that addresses one level upper or lower than the target element. This element can represent 334 that the object referred to in this element composes or be composed by the parent element.
335
336 Example: Product “A” family includes product “A1” and product “A2”.

PPS Part 1: Core Elements, Version 1.0
Copyright © OASIS® 2007-2009. All Rights Reserved.
21 September 2009
Page 13 of 31
Example: Product “B” is assembled with 2 of parts “C1” and 3 of parts “C2”.

Example: 2 of parts “C1” are used for product “B1”, and 5 of parts “C1” are used for product “B2”.

### 3.2.2 Produce element

*Produce* element defines a relation between processes and items, or a relation between operations and lots. This element can show the quantity of the item or lot produced by the process or operation respectively, or how many items or lots are produced by the process or the operation respectively.

### 3.2.3 Consume element

*Consume* element defines a relation between processes and items, or a relation between operations and lots. This element can show the quantity of the item or lot consumed by the process or operation respectively, or how many items or lots are consumed by the process or operation respectively.

### 3.2.4 Assign element

*Assign* element defines a relation between processes and resources, or a relation between operations and tasks. This element can show the volume of capacity provided by the resource or task assigned for the process or operation respectively, or how many resources or tasks are used.

### 3.2.5 Relation element

*Relation* element can show that the parent element has a specific relation to other primitive elements. This element can additionally define relational classes between primitive elements. Examples include precedence relations and pegging relations.
4 Specific Elements

4.1 Structure of specific element

Specific elements are defined to represent any properties of the primitive element. This element MAY be described more than once on the same parent element if the value is historical. Those multiple properties have time stamp. The type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following constraints.

```xml
<xsd:complexType name="SpecificType">
    <xsd:sequence>
        <xsd:element ref="Start" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="End" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Event" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Price" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Cost" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Priority" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Display" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Description" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Author" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Date" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Qty" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Char" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="Time" minOccurs="0" maxOccurs="unbounded"/>
    </xsd:sequence>
    <xsd:attribute name="id" type="xsd:string"/>
    <xsd:attribute name="key" type="xsd:long"/>
    <xsd:attribute name="name" type="xsd:string"/>
    <xsd:attribute name="type" type="xsd:string"/>
    <xsd:attribute name="status" type="xsd:string"/>
    <xsd:attribute name="apply" type="xsd:string"/>
</xsd:complexType>
```

- `id` attribute SHOULD represent an identifier of this element.
- `key` attribute SHOULD represent a key used in the local applications.
- `name` attribute SHOULD represent the name of this element.
- `type` attribute SHOULD represent the division of this element.
- `status` attribute SHOULD represent the status of this element.
- `apply` attribute SHOULD represent application type of this element. Specification of the element is relative, if the value is "relative ".
- `Start` element SHOULD represent the start event of this element.
- `End` element SHOULD represent the completion event of this element.
- `Event` element SHOULD represent the optional event under this element.
- `Price` element SHOULD represent the price of this element.
- `Cost` element SHOULD represent the cost of this element.
- `Priority` element SHOULD represent the priority of this element.
- `Display` element SHOULD represent how to display this element.
- `Description` element SHOULD represent the description of this element.
- `Author` element SHOULD represent the author of this element information.
• *Date* element SHOULD represent the date of this element information.
• *Qty* element SHOULD represent the quantity of this element.
• *Char* element SHOULD represent the qualitative value of this element.
• *Time* element SHOULD represent the time of this element.

4.2 List of specific elements

For specific elements, this part of specifications has four elements: *Location*, *Capacity*, *Progress*, and *Spec*. The type of this element SHOULD be represented with the following XML schema.

```xml
<xsd:element name="Location" type="SpecificType"/>
<xsd:element name="Capacity" type="SpecificType"/>
<xsd:element name="Progress" type="SpecificType"/>
<xsd:element name="Spec" type="SpecificType"/>
```

4.2.1 Location element

*Location* element represents a location. When the expression of location has structure, multiple values can be set by describing different names of the data. Change of the location depending on time can also be represented by multiple values.

Example: Customer’s address

```xml
<Party id="ABC Inc.">
  <Location type="address"><Char value="123 ABC street"/></Location>
  <Location type="city"><Char value="Cambridge"/></Location>
  <Location type="state"><Char value="MA"/></Location>
  <Location type="code"><Char value="02139"/></Location>
  <Location type="country"><Char value="USA"/></Location>
</Party>
```

4.2.2 Capacity element

*Capacity* element represents volume of capability provided by resources, items or processes. In the case of resource capability, it may show available amount of corresponding tasks. In the case of Items, it shows the available amount of Lots. And for Processes, it shows maximum ratio of production. All of this information is represented in a time horizon.

Example: Inventory level of “material01”

```xml
<Item id="material01">
  <Capacity><Qty value="150"/></Capacity>
</Item>
```

Example: Temporal change of the material

```xml
<Item id="material01">
  <Capacity><Qty value="150"/><Time value="2005-04-10T00:00:00"/></Capacity>
  <Capacity><Qty value="200"/><Time value="2005-04-17T00:00:00"/></Capacity>
</Item>
```

Example: Material location information: Stock of “material01” is 150 located at “storage01”

```xml
<Item id="material01">
  <Location value="storage01"/>
</Item>
```
4.2.3 Progress element

Progress element represents progress of order and operation, or status of lot and task. This element shows the latest data, status or progress at a specific time point. This element MAY represent a change of time-dependent values.

4.2.4 Spec element

Spec element represents various specifications for primitive elements. The content can be represented with a pair of a spec name and a value. This element can also represent time-dependent change of the value. The value of the specification is represented with one data type of a numerical value, characters and date time. Spec elements with the same specification name under a common parent element SHOULD be represented with the same data type.
5 Eventual Elements

5.1 Structure of eventual element

Eventual elements represent any properties that occur at one time point. Any type of events can be specified by using this element. The type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following constraints.

```xml
<xsd:complexType name="EventualType">
  <xsd:sequence>
    <xsd:element ref="Priority" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Display" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Description" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Author" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Date" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Qty" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Char" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Time" minOccurs="0" maxOccurs="unbounded"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="xsd:string"/>
  <xsd:attribute name="key" type="xsd:long"/>
  <xsd:attribute name="name" type="xsd:string"/>
  <xsd:attribute name="type" type="xsd:string"/>
  <xsd:attribute name="status" type="xsd:string"/>
  <xsd:attribute name="apply" type="xsd:string"/>
  <xsd:attribute name="condition" type="xsd:string"/>
  <xsd:attribute name="value" type="xsd:string"/>
</xsd:complexType>
```

- **id** attribute SHOULD represent an identifier of this element.
- **key** attribute SHOULD represent a key used in the local applications.
- **name** attribute SHOULD represent the name of this element.
- **type** attribute SHOULD represent the division of this element.
- **status** attribute SHOULD represent the status of this element.
- **apply** attribute SHOULD represent application type of this element. The condition of this element is exclusive, if the value is "exclusive".
- **condition** attribute SHOULD represent the condition of this element.
- **value** attribute SHOULD represent the qualitative value of this element.

- **Priority** element SHOULD represent the priority of this element.
- **Display** element SHOULD represent how to display this element.
- **Description** element SHOULD represent the description of this element.
- **Author** element SHOULD represent the author of this element information.
- **Date** element SHOULD represent the date of this element information.
- **Qty** element SHOULD represent the quantity of this element.
- **Char** element SHOULD represent the qualitative value of this element.
- **Time** element SHOULD represent the time of this element.
5.2 List of eventual elements

This part of specifications defines three eventual elements: Start, End, and Event. The Start and End are special cases of Event element. The type of this element SHOULD be represented with the following XML schema.

```
<xsd:element name="Start" type="EventualType"/>
<xsd:element name="End" type="EventualType"/>
<xsd:element name="Event" type="EventualType"/>
```

### 5.2.1 Start element

Start element represents a start event of orders, processes or operations. In case of order, this element represents an event at the earliest start time of corresponding operations.

### 5.2.2 End element

End element represents an end event of orders, processes or operations. In case of order, this element represents an event at the latest end time of corresponding operations.

### 5.2.3 Event element

Event element represents an event associated with a customer, supplier, item, resource, process or operation. Event brings any action or any status change at a specific time point. In general, the status value of item or resource changes discontinuously before the event.
6 Accounting Elements

6.1 Structure of Accounting element

Accounting element represents any accounting information such as profit revenue and cost spending. Price and cost associated with goods and services are the target of the elements. The type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following constraints.

```
<xsd:complexType name="AccountingType">
  <xsd:sequence>
    <xsd:element ref="Priority" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Display" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Description" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Author" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Date" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Qty" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Char" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Time" minOccurs="0" maxOccurs="unbounded"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="xsd:string"/>
  <xsd:attribute name="key" type="xsd:long"/>
  <xsd:attribute name="name" type="xsd:string"/>
  <xsd:attribute name="type" type="xsd:string"/>
  <xsd:attribute name="status" type="xsd:string"/>
  <xsd:attribute name="value" type="xsd:string"/>
  <xsd:attribute name="condition" type="xsd:string"/>
  <xsd:attribute name="apply" type="xsd:string"/>
</xsd:complexType>
```

- **id** attribute SHOULD represent an identifier of this element.
- **key** attribute SHOULD represent a key used in the local applications.
- **name** attribute SHOULD represent the name of this element.
- **type** attribute SHOULD represent the division of this element.
- **status** attribute SHOULD represent the status of this element.
- **apply** attribute SHOULD represent application type of this element. The condition of this element is exclusive, if the value is "exclusive".
- **condition** attribute SHOULD represent the condition of this element.
- **value** attribute SHOULD represent the qualitative value of this element.
- **Priority** element SHOULD represent the priority of this element.
- **Display** element SHOULD represent how to display this element.
- **Description** element SHOULD represent the description of this element.
- **Author** element SHOULD represent the author of this element information.
- **Date** element SHOULD represent the date of this element information.
- **Qty** element SHOULD represent the quantitative value of this element.
- **Char** element SHOULD represent the qualitative value of this element.
- **Time** element SHOULD represent the temporal value of this element.
6.2 List of accounting elements

For accounting elements, Price element and Cost element are defined in this specification. The type of this element SHOULD be represented with the following XML schema.

```
<xsd:element name="Price" type="AccountingType"/>
<xsd:element name="Cost" type="AccountingType"/>
```

6.2.1 Price element

Price element represents a price. This element can be used to represent price information of primitive element and some properties.

6.2.2 Cost element

Cost element represents a cost. This element can be used to represent cost information of primitive element and some properties.
7 Administrative Elements

7.1 Structure of Administrative Elements

Administrative elements represent any administrative information, which is not the main body of the problem domain but the information how to deal with the domain information. The type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following constraints.

```xml
<xsd:complexType name="AdministrativeType">
  <xsd:sequence>
    <xsd:element ref="Qty" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Char" minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element ref="Time" minOccurs="0" maxOccurs="unbounded"/>
  </xsd:sequence>
  <xsd:attribute name="name" type="xsd:string"/>
  <xsd:attribute name="type" type="xsd:string"/>
  <xsd:attribute name="status" type="xsd:string"/>
  <xsd:attribute name="apply" type="xsd:string"/>
  <xsd:attribute name="condition" type="xsd:string"/>
  <xsd:attribute name="value" type="xsd:string"/>
</xsd:complexType>
```

- `name` attribute SHOULD represent the name of this element.
- `type` attribute SHOULD represent the division of this element.
- `status` attribute SHOULD represent the status of this element.
- `apply` attribute SHOULD represent application type of this element. The condition of this element is exclusive, if the value is "exclusive".
- `condition` attribute SHOULD represent the condition of this element.
- `value` attribute SHOULD represent the qualitative value of this element.
- `Qty` element SHOULD represent the quantitative value of this element.
- `Char` element SHOULD represent the qualitative value of this element.
- `Time` element SHOULD represent the temporal value of this element.

7.2 List of Administrative Elements

For administrative elements, `Priority`, `Display`, `Description`, `Author` and `Date` elements are defined in this specification. The type of this element SHOULD be represented with the following XML schema.

```xml
<xsd:element name="Priority" type="AdministrativeType"/>
<xsd:element name="Display" type="AdministrativeType"/>
<xsd:element name="Description" type="AdministrativeType"/>
<xsd:element name="Author" type="AdministrativeType"/>
<xsd:element name="Date" type="AdministrativeType"/>
```
7.2.1 Priority element

Priority element represents the priority of the primitive element or the parent element. This information is used to make a decision for planning or scheduling.

7.2.2 Display element

Display element is an element to set how to display the parent element. This element can specify colors or display locations on the screen.

7.2.3 Description element

Description element is an element to set an optional comment of the parent element. The comment data type is a character string.

7.2.4 Author element

Author element represents the author and its related information such as the authoring date. This information is not about the target domain model, but information processing model.

7.2.5 Date element

Date element is an element that shows the creation date, expire date, revising date, and so forth. This information is for administrative use of the domain model.
8 Data Elements

8.1 Qty element

Qty element SHOULD represent quantitative information. This element can be used to represent the
quantitative numerical data by decimal type data format. Unit of the value can be set in this element, and
representation of fraction is available. The type of this element SHOULD be represented with the
following XML schema and SHOULD fulfill the following constraints.

```xml
<xsd:element name="Qty">
  <xsd:complexType>
    <xsd:attribute name="name" type="xsd:string"/>
    <xsd:attribute name="type" type="xsd:string"/>
    <xsd:attribute name="status" type="xsd:string"/>
    <xsd:attribute name="apply" type="xsd:string"/>
    <xsd:attribute name="condition" type="xsd:string"/>
    <xsd:attribute name="value" type="xsd:decimal"/>
    <xsd:attribute name="count" type="xsd:long"/>
    <xsd:attribute name="unit" type="xsd:string"/>
    <xsd:attribute name="base" type="xsd:decimal"/>
  </xsd:complexType>
</xsd:element>
```

- `name` attribute SHOULD represent the name of this element.
- `type` attribute SHOULD represent the division of this element.
- `status` attribute SHOULD represent the status of this element.
- `apply` attribute SHOULD represent application type of this element. The condition of this element is
  exclusive, if the value is “exclusive”.
- `condition` attribute SHOULD represent the condition of this element.
- `value` attribute SHOULD represent the content corresponding to the qty element.
- `count` attribute SHOULD represent the countable value of this element.
- `unit` attribute SHOULD represent the type of currency unit data of this element.
- `base` attribute SHOULD represent the base data of this element. The value of the “value” attribute is
  divided with this value.

Example: 1/3 meters

```xml
<Qty value="1" unit="m" base="3"/>
```

Example: 3 weeks (discrete time scale)

```xml
<Qty count="3" unit="week"/>
```

8.2 Char element

Char element SHOULD represent character data. This element can be used to represent a qualitative
value of specification or a value of location. The type of this element SHOULD be represented with the
following XML schema and SHOULD fulfill the following constraints.
8.3 Time element

Time element SHOULD represent a specific time. Time is represented by a continuous time scale, or a specific discrete time scale. The type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following constraints.
• *value* attribute SHOULD represent the content corresponding to the *qty* element.

• *count* attribute SHOULD represent the countable value of this element.

• *unit* attribute SHOULD represent the type of currency unit data of this element.

• *base* attribute SHOULD represent the base data of this element. The value of the "value" attribute is divided with this value.

Example: noon on May 13th, 2005

```xml
<Time value="2005-05-13T12:00:00"/>
```

Example: 2 months later since the present month (May, 2005) (discrete time scale)

```xml
<Time count="2" unit="month" base="2005-05-01T00:00:00"/>
```
A. Object Class diagram

Figure A-1 shows the structure of primitive objects in this specification with a UML class diagram. Each object corresponds to each XML element. In this figure, arrows represent relative information between the source and destination objects. When an arrow has role names, it corresponds to an independent XML element in the specification. This figure doesn’t include all the information of XML schema but the partial information of the primitive elements.

Figure A-1: Primitive objects for representing planning and scheduling problems
### B. Cross reference of elements

Table B-1 shows the relations between elements. The row headers represent parent elements and the column headers represent child elements. Symbol * in the table means 0 or more than 0 element can be described.

#### Table B-1 Element and sub-element relations

<table>
<thead>
<tr>
<th></th>
<th>Compose</th>
<th>Produce</th>
<th>Consume</th>
<th>Assign</th>
<th>Relation</th>
<th>Location</th>
<th>Capacity</th>
<th>Progress</th>
<th>Spec</th>
<th>Start</th>
<th>End</th>
<th>Event</th>
<th>Price</th>
<th>Cost</th>
<th>Priority</th>
<th>Display</th>
<th>Description</th>
<th>Author</th>
<th>Date</th>
<th>Qty</th>
<th>Char</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Produce</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consume</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assign</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Char</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following table B-2 shows the correspondence between elements and attributes. The row headers show the element name, and the column headers show attribute names. The characters in the table represent data types. The character in the table are used as follows: “U” denotes identification character of element, “P” denotes an identification character of referencing elements, “S” denotes the character string, “D” denotes a decimal number, “N” denotes an integer number and “T” for date time. Boldface means required information.

### Table B-2 Element and attribute relations

<table>
<thead>
<tr>
<th></th>
<th>id</th>
<th>key</th>
<th>name</th>
<th>parent</th>
<th>type</th>
<th>status</th>
<th>apply</th>
<th>condition</th>
<th>count</th>
<th>unit</th>
<th>base</th>
<th>party</th>
<th>plan</th>
<th>order</th>
<th>item</th>
<th>resource</th>
<th>process</th>
<th>lot</th>
<th>task</th>
<th>operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plan</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lot</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compose</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Produce</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consume</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assign</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relation</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progress</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spec</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>U</td>
<td>N</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qty</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>D</td>
<td>N</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Char</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>N</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>N</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C. Acknowledgements

The following individuals have participated in the creation of this specification and are gratefully acknowledged:

Participants:

Shinya Matsukawa, Hitachi
Tomohiko Maeda, Fujitsu
Masahiro Mizutani, Unisys Corporation
Akihiro Kawauchi, Individual Member
Yuto Banba, PSLX Forum
Osamu Sugi, PSLX Forum
Hideichi Okamune, PSLX Forum
Hiroshi Kojima, PSLX Forum
Ken Nakayama, Hitachi
Yukio Hamaguchi, Hitachi
Tomoichi Sato, Individual
Hiroaki Sasaki, Individual
## D. Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Editor</th>
<th>Changes Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td></td>
<td>Y.Nishioka</td>
<td></td>
</tr>
</tbody>
</table>