

PPS (Production Planning and Scheduling) Part 1: Core Elements, Version 1.0

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Abstract:

OASIS PPS (Production Planning and Scheduling) Standard deals with problems in all manufacturing companies who want to have a sophisticated information system for production planning and scheduling. PPS standard provides XML schema and communication protocols for information exchange among manufacturing application programs in the web-services environment. This document especially focuses on information model of core elements in the production planning and scheduling domain. Since the elements have been designed without specific 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/>.

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1 Introduction

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

If information is exchanged between some applications related to Production Planning and Scheduling, 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 or sites and detail scheduling in the individual areas and sites.

This specification doesn't aim at 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

- [RFC2119] S. Bradner, *Key words for use in RFCs to Indicate Requirement Levels*, <http://www.ietf.org/rfc/rfc2119.txt>, IETF RFC 2119, March 1997.
- [PPS02] PPS (Production Planning and Scheduling) Part 2: Transaction Messages, Version 1.0, Public Review Draft 01, <http://www.oasis-open.org/committees/pps/>
- [PPS03] PPS (Production Planning and Scheduling) Part 3: Profile Specifications, Version 1.0, Public Review Draft 01, <http://www.oasis-open.org/committees/pps/>

1.3 Non-Normative References

- [PSLXWP] PSLX Consortium, PSLX White Paper - APS Conceptual definition and implementation, <http://www.pslx.org/>
- [PSLX001] PSLX Technical Standard, Version 2, Part 1: Enterprise Model (in Japanese), Recommendation of PSLX Forum, <http://www.pslx.org/>
- [PSLX002] PSLX Technical Standard, Version 2, Part 2: Activity Model (in Japanese), Recommendation of PSLX Forum, <http://www.pslx.org/>
- [PSLX003] PSLX Technical Standard, Version 2, Part 3: Object Model (in Japanese), Recommendation of PSLX Forum, <http://www.pslx.org/>

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-core-elements.xsd>

43 **1.5 Terms and definitions**

44 **plan**

45 representation unit for intensive information of related orders corresponding to a specific period
46 on a discrete time scale, or calculated information on the schedule under the related orders. It
47 may become actual results of the progress according to the timing of the action, whether it is in
48 the past or future.

49 **order**

50 unit of requirement describing concrete item, resource or operation in a specific place at a
51 specific time. It can also represent the results to the request.

52 **party**

53 customer who is a sender of an order and has a demand to make a decision, or supplier thow is a
54 receiver in case that a decision-maker sends the demand that can't be handled inside.

55 **item**

56 object to be produced or consumed by production activity. The quantity or the quality of item is
57 changed by means of the production activity.

58 Example : product, parts, module, unit, work in process, materials

59 **resource**

60 object that can provide essential function for production activity. The capacity of function is used
61 during production activity but is available again after finishing production.

62 Example: equipment, machine, device, labor, tool

63 **process**

64 element of production activity indicating a concrete production method. It has duration and gives
65 the added value to a produced item. One function may have two or more functions in a more
66 detail unit inside.

67 **lot**

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

71 **task**

72 unit of necessity to execute a specific function at a specific time, indicating the volume of used
73 capability provided by the applicable resource.

74 Notes: Task represents either the capacity value provided by resource at a specific time point or
75 the aggregated total value of capacity provided by resource during specific duration.

76 **operation**

77 actual processing element to be executed by a specific task and to produce or consume a
78 specific lot. It is a concrete instance of function in production activity.

79

2 Primitive Elements

80

2.1 Structure of primitive elements

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

84

```

85 <xsd:complexType name="PrimitiveType">
86   <xsd:sequence>
87     <xsd:element ref="Compose" minOccurs="0" maxOccurs="unbounded"/>
88     <xsd:element ref="Produce" minOccurs="0" maxOccurs="unbounded"/>
89     <xsd:element ref="Consume" minOccurs="0" maxOccurs="unbounded"/>
90     <xsd:element ref="Assign" minOccurs="0" maxOccurs="unbounded"/>
91     <xsd:element ref="Relation" minOccurs="0" maxOccurs="unbounded"/>
92     <xsd:element ref="Location" minOccurs="0" maxOccurs="unbounded"/>
93     <xsd:element ref="Capacity" minOccurs="0" maxOccurs="unbounded"/>
94     <xsd:element ref="Progress" minOccurs="0" maxOccurs="unbounded"/>
95     <xsd:element ref="Spec" minOccurs="0" maxOccurs="unbounded"/>
96     <xsd:element ref="Start" minOccurs="0" maxOccurs="unbounded"/>
97     <xsd:element ref="End" minOccurs="0" maxOccurs="unbounded"/>
98     <xsd:element ref="Event" minOccurs="0" maxOccurs="unbounded"/>
99     <xsd:element ref="Price" minOccurs="0" maxOccurs="unbounded"/>
100    <xsd:element ref="Cost" minOccurs="0" maxOccurs="unbounded"/>
101    <xsd:element ref="Priority" minOccurs="0" maxOccurs="unbounded"/>
102    <xsd:element ref="Display" minOccurs="0" maxOccurs="unbounded"/>
103    <xsd:element ref="Description" minOccurs="0" maxOccurs="unbounded"/>
104    <xsd:element ref="Author" minOccurs="0" maxOccurs="unbounded"/>
105    <xsd:element ref="Date" minOccurs="0" maxOccurs="unbounded"/>
106    <xsd:element ref="Qty" minOccurs="0" maxOccurs="unbounded"/>
107    <xsd:element ref="Char" minOccurs="0" maxOccurs="unbounded"/>
108    <xsd:element ref="Duration" minOccurs="0" maxOccurs="unbounded"/>
109    <xsd:element ref="Time" minOccurs="0" maxOccurs="unbounded"/>
110  </xsd:sequence>
111  <xsd:attribute name="id" type="xsd:string" use="required"/>
112  <xsd:attribute name="key" type="xsd:long"/>
113  <xsd:attribute name="name" type="xsd:string"/>
114  <xsd:attribute name="parent" type="xsd:string"/>
115  <xsd:attribute name="type" type="xsd:string"/>
116  <xsd:attribute name="status" type="xsd:string"/>
117  <xsd:attribute name="party" type="xsd:string"/>
118  <xsd:attribute name="plan" type="xsd:string"/>
119  <xsd:attribute name="order" type="xsd:string"/>
120  <xsd:attribute name="item" type="xsd:string"/>
121  <xsd:attribute name="resource" type="xsd:string"/>
122  <xsd:attribute name="process" type="xsd:string"/>
123  <xsd:attribute name="lot" type="xsd:string"/>
124  <xsd:attribute name="task" type="xsd:string"/>
125  <xsd:attribute name="operation" type="xsd:string"/>
126 </xsd:complexType>

```

127

- 128 • *id* attribute SHOULD represent an identifier of this element.
- 129 • *key* attribute SHOULD represent a key used in the local applications.
- 130 • *name* attribute SHOULD represent the name of this element.
- 131 • *parent* attribute SHOULD represent the identifier of the inherited element of this element.
- 132 • *type* attribute SHOULD represent the division of this element.
- 133 • *status* attribute SHOULD represent the status of this element.
- 134 • *party* attribute SHOULD represent an identifier of the party associated with this element.

- 135 • *plan* attribute SHOULD represent the identifier of the plan associated with this element.
- 136 • *order* attribute SHOULD represent the identifier of the order associated with this element.
- 137 • *item* attribute SHOULD represent the identifier of the item associated with this element.
- 138 • *resource* attribute SHOULD represent the identifier of the resource associated with this element.
- 139 • *process* attribute SHOULD represent the identifier of the process associated with this element.
- 140 • *lot* attribute SHOULD represent the identifier of the lot associated with this element.
- 141 • *task* attribute SHOULD represent the identifier of the task associated with this element.
- 142 • *operation* attribute SHOULD represent the identifier of the operation associated with this element.
- 143
- 144 • *Compose* element SHOULD represent the element corresponding to part of this element.
- 145 • *Produce* element SHOULD represent the relation that this element produces.
- 146 • *Consume* element SHOULD represent the relation that this element consumes.
- 147 • *Assign* element SHOULD represent the relation that this element uses.
- 148 • *Relation* element SHOULD represent the relation to other primitive elements.
- 149 • *Location* element SHOULD represent the location where this element exists.
- 150 • *Capacity* element SHOULD represent the capacity status of this element.
- 151 • *Progress* element SHOULD represent the progress of this element.
- 152 • *Spec* element SHOULD represent the specification of this element.
- 153 • *Start* element SHOULD represent the start event of this element.
- 154 • *End* element SHOULD represent the completion event of this element.
- 155 • *Event* element SHOULD represent the optional event under this element.
- 156 • *Price* element SHOULD represent the price of this element.
- 157 • *Cost* element SHOULD represent the cost of this element.
- 158 • *Priority* element SHOULD represent the priority of this element.
- 159 • *Display* element SHOULD represent how to display this element.
- 160 • *Description* element SHOULD represent the description of this element.
- 161 • *Author* element SHOULD represent the author of this element information.
- 162 • *Date* element SHOULD represent the date of this element information.
- 163 • *Qty* element SHOULD represent the quantity of this element.
- 164 • *Char* element SHOULD represent the qualitative value of this element.
- 165 • *Duration* element SHOULD represent the net duration of this element.
- 166 • *Time* element SHOULD represent the time of this element.

167 2.2 List of primitive elements

168 This standard defines nine primitive elements: *Party*, *Plan*, *Order*, *Item*, *Resource*, *Process*, *Lot*, *Task*,
 169 and *Operation*. The type of this element SHOULD be represented with the following XML schema.

170

```

171 <xsd:element name="Party" type="PrimitiveType"/>
172 <xsd:element name="Plan" type="PrimitiveType"/>
173 <xsd:element name="Order" type="PrimitiveType"/>
174 <xsd:element name="Item" type="PrimitiveType"/>
175 <xsd:element name="Resource" type="PrimitiveType"/>
176 <xsd:element name="Process" type="PrimitiveType"/>
177 <xsd:element name="Lot" type="PrimitiveType"/>

```

```
178 <xsd:element name="Task" type="PrimitiveType"/>
179 <xsd:element name="Operation" type="PrimitiveType"/>
```

180

181 2.2.1 Party element

182 *Party* element represents customer and supplier. Customer is an object that requests some products or
183 services from the enterprise. Such requests are sent to a person in charge of production planning or
184 scheduling. Supplier is an object providing some products or services to the enterprise. Supplier
185 receives orders form the enterprise and provides additional item, resource or function to the enterprise.

186 2.2.2 Order element

187 *Order* element represents an object of information produced to request some products or services. *Order*
188 is a source to finally dispatch a schedule to the plant floor. Orders can be divided into an item order, a
189 resource order and a function order according to the type of request.

190

191 Example: Ten of “A” products are requested.

```
192 <Order id="Z01" item="A">
193 <Qty value="10"/>
194 </Order>
```

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

```
196 <Order id="Z02" resource="groupB">
197 <Qty value="3"/>
198 </Order>
```

199 Example: Switching operation is requested two times.

```
200 <Order id="Z03" process="change01">
201 <Qty value="2"/>
202 </Order>
```

203 Example: An Order, which consist of ten “A” products and five “B” products, is total 3,000 yen.

```
204 <Order id="Z00">
205 <Compose order="Z01"/>
206 <Compose order="Z02"/>
207 <Price value="3000" unit="yen"/>
208 </Order>
209 <Order id="Z01" item="A">
210 <Qty value="10"/>
211 </Order>
212 <Order id="Z02" item="B">
213 <Qty value="5"/>
214 </Order>
```

215

216 2.2.3 Item element

217 *Item* element represents a product, component, parts, work in process (WIP), raw material and other
218 items. Item is produced by any function, and after that, it is consumed by another function.

219 2.2.4 Resource element

220 *Resource* element represents a resource. Resource is an object enabling production, transportation,
221 storage, inspection and other various services. Resource is assigned to an operation after considering its
222 capacity.

223 **2.2.5 Function element**

224 *Function* element represents a function. Function is a unit of activities in production process, and
225 produces and consumes items by being executed for certain duration.

226 **2.2.6 Lot element**

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

230 **2.2.7 Task element**

231 *Task* element represents a task. Task is an object showing the usage of a specific resource for a specific
232 period. Schedule requests a task for each resource assigned to execute the operation.

233

234 Example: Task corresponding to the quantity of work that 3 labors work for 2 days

```
235 <Task id="T01">  
236 <Qty value="3" unit="human"/>  
237 <Duration value="P0Y0M2DT0H0M0S"/>  
238 </Task>
```

239

240 **2.2.8 Operation element**

241 *Operation* element represents an activity to dispatch. Operation makes a function executed at a specific
242 place on a plant floor for a specific time. Operation is associated with a specific lot or task by executing
243 the activity.

244

3 Relational Elements

245

3.1 Structure of relational elements

246

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.

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286

```
<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="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="Duration" 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="value" type="xsd:double"/>
  <xsd:attribute name="disjunctive" type="xsd:boolean"/>
  <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>
```

287

288

- *id* attribute SHOULD represent an identifier of this element.

289

- *key* attribute SHOULD represent a key used in the local applications.

290

- *name* attribute SHOULD represent the name of this element.

291

- *type* attribute SHOULD represent the division of this element.

292

- *value* attribute SHOULD represent the content corresponding to the qty element.

293

- *disjunctive* attribute SHOULD represent one of the following values. The default value of this attribute SHOULD be set "false".

294

295

- If the attribute value is "true", it SHOULD be represented that this element is a disjunctive (OR) content under the parent element.

296

- 297 – If the attribute value is "false", it SHOULD be represented that this element is a conjunctive (AND)
298 content under the parent element.
- 299 • *party* attribute SHOULD represent an identifier of the party associated with this element.
 - 300 • *plan* attribute SHOULD represent the identifier of the plan associated with this element.
 - 301 • *order* attribute SHOULD represent the identifier of the order associated with this element.
 - 302 • *item* attribute SHOULD represent the identifier of the item associated with this element.
 - 303 • *resource* attribute SHOULD represent the identifier of the resource associated with this element.
 - 304 • *process* attribute SHOULD represent the identifier of the process associated with this element.
 - 305 • *lot* attribute SHOULD represent the identifier of the lot associated with this element.
 - 306 • *task* attribute SHOULD represent the identifier of the task associated with this element.
 - 307 • *operation* attribute SHOULD represent the identifier of the operation associated with this element.
 - 308
 - 309 • *Location* element SHOULD represent the location associated with this element.
 - 310 • *Capacity* element SHOULD represent the capacity status of this element.
 - 311 • *Progress* element SHOULD represent the progress of this element.
 - 312 • *Spec* element SHOULD represent the specification of this element.
 - 313 • *Start* element SHOULD represent the start event of this element.
 - 314 • *End* element SHOULD represent the completion event of this element.
 - 315 • *Event* element SHOULD represent the optional event under this element.
 - 316 • *Price* element SHOULD represent the price of this element.
 - 317 • *Cost* element SHOULD represent the cost of this element.
 - 318 • *Priority* element SHOULD represent the priority of this element.
 - 319 • *Display* element SHOULD represent how to display this element.
 - 320 • *Description* element SHOULD represent the description of this element.
 - 321 • *Author* element SHOULD represent the author of this element information.
 - 322 • *Date* element SHOULD represent the date of this element information.
 - 323 • *Qty* element SHOULD represent the quantity of this element.
 - 324 • *Char* element SHOULD represent the qualitative value of this element.
 - 325 • *Duration* element SHOULD represent the net duration of this element.
 - 326 • *Time* element SHOULD represent the time of this element.
 - 327

328 3.2 List of relational elements

329 This standard defines five relational elements: *Compose*, *Produce*, *Consume*, *Assign*, and *Relation*. The
330 type of this element SHOULD be represented with the following XML schema.

331

```
332 <xsd:element name="Compose" type="RelationalType"/>  
333 <xsd:element name="Produce" type="RelationalType"/>  
334 <xsd:element name="Consume" type="RelationalType"/>  
335 <xsd:element name="Assign" type="RelationalType"/>  
336 <xsd:element name="Relation" type="RelationalType"/>
```

337

338 3.2.1 Compose element

339 *Compose* element defines a hierarchical relation between two same primitive elements. This element
340 can represent that the object referred to in this element composes or be composed by the upper level
341 element.

342

343 Example: Product “A” group includes product “A1” and product “A2”.

```
344 <Item id="A">  
345 <Compose type="pps:child" item="A1"/>  
346 <Compose type="pps:child" item="A2"/>  
347 </Item>
```

348 Example: Product “B” is assembled with 2 of parts “C1” and 3 of parts “C2”.

```
349 <Item id="B">  
350 <Compose type="pps:child" item="C1" value="2"/>  
351 <Compose type="pps:child" item="C2" value="3"/>  
352 </Item>
```

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

```
354 <Item id="C1">  
355 <Compose type="pps:parent" item="B1"><Qty value="2"/></Compose>  
356 <Compose type="pps:parent" item="B2"><Qty value="5"/></Compose>  
357 </Item>
```

358

359 3.2.2 Produce element

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

363 3.2.3 Consume element

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

367 3.2.4 Assign element

368 *Assign* element defines a relation between function and resource, or a relation between operation and
369 task. This element can show the quantity of the resource or task used by the function or operation
370 respectively, or how many resources or tasks are used by the function or operation respectively.

371 3.2.5 Relation element

372 *Relation* element can show that one element in Primitive elements has a specific relation to other
373 elements. This element can additionally define relational classes between primitive elements. The type
374 of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following
375 constraints.

376

4 Specific Elements

377

4.1 Structure of specific element

378

Specific elements are defined to represent any properties. These elements MAY have multiple instances with its time stamp. The type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the following constraints.

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406

```
<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="Duration" 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="relative" type="xsd:boolean"/>
</xsd:complexType>
```

407

408

- *id* attribute SHOULD represent an identifier of this element.

409

- *key* attribute SHOULD represent a key used in the local applications.

410

- *name* attribute SHOULD represent the name of this element.

411

- *type* attribute SHOULD represent the division of this element.

412

- *status* attribute SHOULD represent the status of this element.

413

- *value* attribute SHOULD represent the content corresponding to the qty element.

414

- *relative* attribute SHOULD represent whether specifying spec is relative. The default value of this attribute SHOULD be "false".

415

416

417

- *Start* element SHOULD represent the start event of this element.

418

- *End* element SHOULD represent the completion event of this element.

419

- *Event* element SHOULD represent the optional event under this element.

420

- *Price* element SHOULD represent the price of this element.

421

- *Cost* element SHOULD represent the cost of this element.

422

- *Priority* element SHOULD represent the priority of this element.

423

- *Display* element SHOULD represent how to display this element.

424

- *Description* element SHOULD represent the description of this element.

- 425 • *Author* element SHOULD represent the author of this element information.
- 426 • *Date* element SHOULD represent the date of this element information.
- 427 • *Qty* element SHOULD represent the quantity of this element.
- 428 • *Char* element SHOULD represent the qualitative value of this element.
- 429 • *Duration* element SHOULD represent the net duration of this element.
- 430 • *Time* element SHOULD represent the time of this element.

4.2 List of specific elements

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

435

```
436 <xsd:element name="Location" type="SpecificType"/>
437 <xsd:element name="Capacity" type="SpecificType"/>
438 <xsd:element name="Progress" type="SpecificType"/>
439 <xsd:element name="Spec" type="SpecificType"/>
```

440

4.2.1 Location element

442 *Location* element represents a location. When the expression of location has structure, multiple values
443 can be set by specifying different names of the data. Change of the location can be represented time-
444 dependently.

445

446 Example: Customer's address

```
447 <Party id="ABC Inc.">
448 <Location type="pps:address"><Char value="123 ABC street"/></Location>
449 <Location type="pps:city"><Char value="Cambridge"/></Location>
450 <Location type="pps:state"><Char value="MA"/></Location>
451 <Location type="pps:code"><Char value="02139"/></Location>
452 <Location type="pps:country"><Char value="USA"/></Location>
453 </Party>
```

454

4.2.2 Capacity element

456 *Capacity* element represents volume of capability of Resource, Item and Process. For Resource, it shows
457 available summary of corresponding tasks. For Item, it shows the available summary of Lots. And for
458 Process, it shows available rate of production. All of this information is represented in a time horizon.

459

460 Example: Inventory level of "material01"

```
461 <Item id="material01">
462 <Capacity><Qty value="150"/></Capacity>
463 </Item>
```

464 Example: Temporal change of the material

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

469 Example: Material location information: Stock of "material01" is 150 located at "storage01"


```
470 <Item id="material01">
471 <Capacity><Location value="storage01"/><Qty value="150"/></Capacity>
472 </Item>
```

473 Example: Person X is available at A for 10 hours, and B for 8 hours.

```
474 <Resource id="Person X">
475 <Capacity>
476 <Location value="A"/>
477 <Duration value="P0Y0M0DT10H0M0S"/>
478 </Capacity>
479 <Capacity>
480 <Location value="B"/>
481 <Duration value="P0Y0M0DT8H0M0S"/>
482 </Capacity>
483 </Resource>
```

484

485 4.2.3 Progress element

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

489 4.2.4 Spec element

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

495

5 Eventual Elements

496

5.1 Structure of eventual element

497

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.

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521

```
<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="Duration" 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="exclusive" type="xsd:boolean"/>
</xsd:complexType>
```

522

523

- *id* attribute SHOULD represent an identifier of this element.

524

- *key* attribute SHOULD represent a key used in the local applications.

525

- *name* attribute SHOULD represent the name of this element.

526

- *type* attribute SHOULD represent the division of this element.

527

- *status* attribute SHOULD represent the status of this element.

528

- *value* attribute SHOULD represent the content corresponding to the qty element.

529

- *condition* attribute SHOULD represent the condition of this element.

530

- *exclusive* attribute SHOULD represent whether exclusive or not for the condition of this element.

531

Default value is "false".

532

533

- *Priority* element SHOULD represent the priority of this element.

534

- *Display* element SHOULD represent how to display this element.

535

- *Description* element SHOULD represent the description of this element.

536

- *Author* element SHOULD represent the author of this element information.

537

- *Date* element SHOULD represent the date of this element information.

538

- *Qty* element SHOULD represent the quantity of this element.

539

- *Char* element SHOULD represent the qualitative value of this element.

540

- *Duration* element SHOULD represent the net duration of this element.

541

- *Time* element SHOULD represent the time of this element.

542

543 **5.2 List of eventual elements**

544 This standard defines three eventual elements: *Start*, *End*, and *Event*. The *Start* and *End* is special cases
545 of *Event* element. The type of this element SHOULD be represented with the following XML schema.

546

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

550

551 **5.2.1 Start element**

552 *Start* element represents a start event of order or operation. In case of order, this element represents an
553 event at the earliest start time of corresponding operations.

554 **5.2.2 End element**

555 *End* element represents an end event of order or operation. In case of order, this element represents an
556 event at the latest end time of corresponding operations.

557 **5.2.3 Event element**

558 *Event* element represents an event attending with a customer, supplier, item, resource, function or
559 operation. Event brings any action or any status change at a specific time point. In general, the status
560 value of item or resource changes discontinuously before the event.

561

562

6 Accounting Elements

563

6.1 Structure of Accounting element

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

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588

```
<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="Duration" 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:decimal"/>
  <xsd:attribute name="condition" type="xsd:string"/>
  <xsd:attribute name="exclusive" type="xsd:boolean"/>
</xsd:complexType>
```

589

590

- *id* attribute SHOULD represent an identifier of this element.

591

- *key* attribute SHOULD represent a key used in the local applications.

592

- *name* attribute SHOULD represent the name of this element.

593

- *type* attribute SHOULD represent the division of this element.

594

- *status* attribute SHOULD represent the status of this element.

595

- *value* attribute SHOULD represent the content corresponding to the qty element.

596

- *condition* attribute SHOULD represent the condition of this element.

597

- *exclusive* attribute SHOULD represent whether exclusive or not for the condition of this element.

598

Default value is "false".

599

600

- *Priority* element SHOULD represent the priority of this element.

601

- *Display* element SHOULD represent how to display this element.

602

- *Description* element SHOULD represent the description of this element.

603

- *Author* element SHOULD represent the author of this element information.

604

- *Date* element SHOULD represent the date of this element information.

605

- *Qty* element SHOULD represent the quantity of this element.

606

- *Char* element SHOULD represent the qualitative value of this element.

607

- *Duration* element SHOULD represent the net duration of this element.

608

- *Time* element SHOULD represent the time of this element.

609

610 **6.2 List of accounting elements**

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

613

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

616

617 **6.2.1 Price element**

618 *Price* element represents a price. This element can be used to represent price information of primitive
619 element and some properties. The currency unit can be set if necessary.

620 **6.2.2 Cost element**

621 *Cost* element represents a cost. This element can be used to represent cost information of primitive
622 element and some properties. The currency unit can be set if necessary.

623

624

7 Administrative Elements

625

7.1 Structure of Administrative Elements

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

629

630

631

632

633

634

635

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637

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639

640

641

642

```
<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="Duration" 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="value" type="xsd:string"/>
  <xsd:attribute name="condition" type="xsd:string"/>
  <xsd:attribute name="exclusive" type="xsd:boolean"/>
</xsd:complexType>
```

643

644

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654

655

- *name* attribute SHOULD represent the name of this element.
- *type* attribute SHOULD represent the division of this element.
- *value* attribute SHOULD represent the content corresponding to the *qty* element.
- *condition* attribute SHOULD represent the condition of this element.
- *exclusive* attribute SHOULD represent whether exclusive or not for the condition of this element. Default value is "false".
- *Qty* element SHOULD represent the quantity of this element.
- *Char* element SHOULD represent the qualitative value of this element.
- *Duration* element SHOULD represent the net duration of this element.
- *Time* element SHOULD represent the time of this element.

656

7.2 List of Administrative Elements

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

659

660

661

662

663

664

```
<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"/>
```

665

666 **7.2.1 Priority element**

667 *Priority* element represents the priority of primitive elements or relational elements. This information is
668 used to make a decision for planning or scheduling.

669 **7.2.2 Display element**

670 *Display* element is an element to set how to display primitive elements. This element can specify colors or
671 display locations on the screen.

672 **7.2.3 Description element**

673 *Description* element is an element to set an optional comment to some elements of primitive elements.
674 The comment data type is a character string.

675 **7.2.4 Author element**

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

678 **7.2.5 Date element**

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

681

8 Data Elements

8.1 Qty element

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

687

```
688 <xsd:element name="Qty">  
689 <xsd:complexType>  
690 <xsd:attribute name="name" type="xsd:string"/>  
691 <xsd:attribute name="type" type="xsd:string"/>  
692 <xsd:attribute name="status" type="xsd:string"/>  
693 <xsd:attribute name="value" type="xsd:decimal"/>  
694 <xsd:attribute name="condition" type="xsd:string"/>  
695 <xsd:attribute name="exclusive" type="xsd:boolean"/>  
696 <xsd:attribute name="count" type="xsd:long"/>  
697 <xsd:attribute name="unit" type="xsd:string"/>  
698 <xsd:attribute name="base" type="xsd:decimal"/>  
699 </xsd:complexType>  
700 </xsd:element>
```

701

- 702 • *name* attribute SHOULD represent the name of this element.
- 703 • *type* attribute SHOULD represent the division of this element.
- 704 • *status* attribute SHOULD represent the status of this element.
- 705 • *value* attribute SHOULD represent the content corresponding to the qty element.
- 706 • *condition* attribute SHOULD represent the condition of this element.
- 707 • *exclusive* attribute SHOULD represent whether exclusive or not for the condition of this element.
708 Default value is "false".
- 709 • *count* attribute SHOULD represent the countable value of this element.
- 710 • *unit* attribute SHOULD represent the type of currency unit data of this element.
- 711 • *base* attribute SHOULD represent the base data of this element. The value of the "value" attribute is
712 divided with this value.

713

714 Example: 1/3 meters

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

716

8.2 Char element

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

721

```
722 <xsd:element name="Char">  
723 <xsd:complexType>  
724 <xsd:attribute name="name" type="xsd:string"/>  
725 <xsd:attribute name="type" type="xsd:string"/>
```



```

726 <xsd:attribute name="status" type="xsd:string"/>
727 <xsd:attribute name="value" type="xsd:string"/>
728 <xsd:attribute name="condition" type="xsd:string"/>
729 <xsd:attribute name="exclusive" type="xsd:boolean"/>
730 <xsd:attribute name="count" type="xsd:long"/>
731 <xsd:attribute name="unit" type="xsd:string"/>
732 <xsd:attribute name="base" type="xsd:string"/>
733 </xsd:complexType>
734 </xsd:element>

```

- 735
- 736 • *name* attribute SHOULD represent the name of this element.
 - 737 • *type* attribute SHOULD represent the division of this element.
 - 738 • *status* attribute SHOULD represent the status of this element.
 - 739 • *value* attribute SHOULD represent the content corresponding to the qty element.
 - 740 • *condition* attribute SHOULD represent the condition of this element.
 - 741 • *exclusive* attribute SHOULD represent whether exclusive or not for the condition of this element.
 - 742 Default value is “false”.
 - 743 • *count* attribute SHOULD represent the countable value of this element.
 - 744 • *unit* attribute SHOULD represent the type of currency unit data of this element.
 - 745 • *base* attribute SHOULD represent the base data of this element. The value of the “value” attribute is
 - 746 divided with this value.

747

748 8.3 Duration element

749 *Duration* element SHOULD represent duration. Duration presented by this element is indicated with either
750 continuous time scale such as day, hour, minute and second, or discrete time under a specific scale. The
751 type of this element SHOULD be represented with the following XML schema and SHOULD fulfill the
752 following constraints.

753

```

754 <xsd:element name="Duration">
755 <xsd:complexType>
756 <xsd:attribute name="name" type="xsd:string"/>
757 <xsd:attribute name="type" type="xsd:string"/>
758 <xsd:attribute name="status" type="xsd:string"/>
759 <xsd:attribute name="value" type="xsd:duration"/>
760 <xsd:attribute name="condition" type="xsd:string"/>
761 <xsd:attribute name="exclusive" type="xsd:boolean"/>
762 <xsd:attribute name="count" type="xsd:long"/>
763 <xsd:attribute name="unit" type="xsd:string"/>
764 <xsd:attribute name="base" type="xsd:duration"/>
765 </xsd:complexType>
766 </xsd:element>

```

- 767
- 768 • *name* attribute SHOULD represent the name of this element.
 - 769 • *type* attribute SHOULD represent the division of this element.
 - 770 • *status* attribute SHOULD represent the status of this element.
 - 771 • *value* attribute SHOULD represent the content corresponding to the qty element.
 - 772 • *condition* attribute SHOULD represent the condition of this element.
 - 773 • *exclusive* attribute SHOULD represent whether exclusive or not for the condition of this element.
 - 774 Default value is “false”.
 - 775 • *count* attribute SHOULD represent the countable value of this element.

- 776 • *unit* attribute SHOULD represent the type of currency unit data of this element.
- 777 • *base* attribute SHOULD represent the base data of this element. The value of the “value” attribute is
- 778 divided with this value.

779

780 Example: 3 hours and 10 minutes

```
781 <Duration value="P0Y0M0DT3H10M0S"/>
```

782 Example: 3 weeks (discrete time scale)

```
783 <pps:duration count="3" unit="week" base="P0Y0M7DT0H0M0S"/>
```

784

785 8.4 Time element

786 *Time* element SHOULD represent a specific time. Time is represented by a continuous time scale, or a

787 specific discrete time scale. The type of this element SHOULD be represented with the following XML

788 schema and SHOULD fulfill the following constraints.

789

```
790 <xsd:element name="Time">
791   <xsd:complexType>
792     <xsd:attribute name="name" type="xsd:string"/>
793     <xsd:attribute name="type" type="xsd:string"/>
794     <xsd:attribute name="status" type="xsd:string"/>
795     <xsd:attribute name="value" type="xsd:dateTime"/>
796     <xsd:attribute name="condition" type="xsd:string"/>
797     <xsd:attribute name="exclusive" type="xsd:boolean"/>
798     <xsd:attribute name="count" type="xsd:long"/>
799     <xsd:attribute name="unit" type="xsd:string"/>
800     <xsd:attribute name="base" type="xsd:dateTime"/>
801   </xsd:complexType>
802 </xsd:element>
```

803

- 804 • *name* attribute SHOULD represent the name of this element.
- 805 • *type* attribute SHOULD represent the division of this element.
- 806 • *status* attribute SHOULD represent the status of this element.
- 807 • *value* attribute SHOULD represent the content corresponding to the qty element.
- 808 • *condition* attribute SHOULD represent the condition of this element.
- 809 • *exclusive* attribute SHOULD represent whether exclusive or not for the condition of this element.
- 810 Default value is “false”.
- 811 • *count* attribute SHOULD represent the countable value of this element.
- 812 • *unit* attribute SHOULD represent the type of currency unit data of this element.
- 813 • *base* attribute SHOULD represent the base data of this element. The value of the “value” attribute is
- 814 divided with this value.

815

816 Example: noon on May 13th, 2005

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

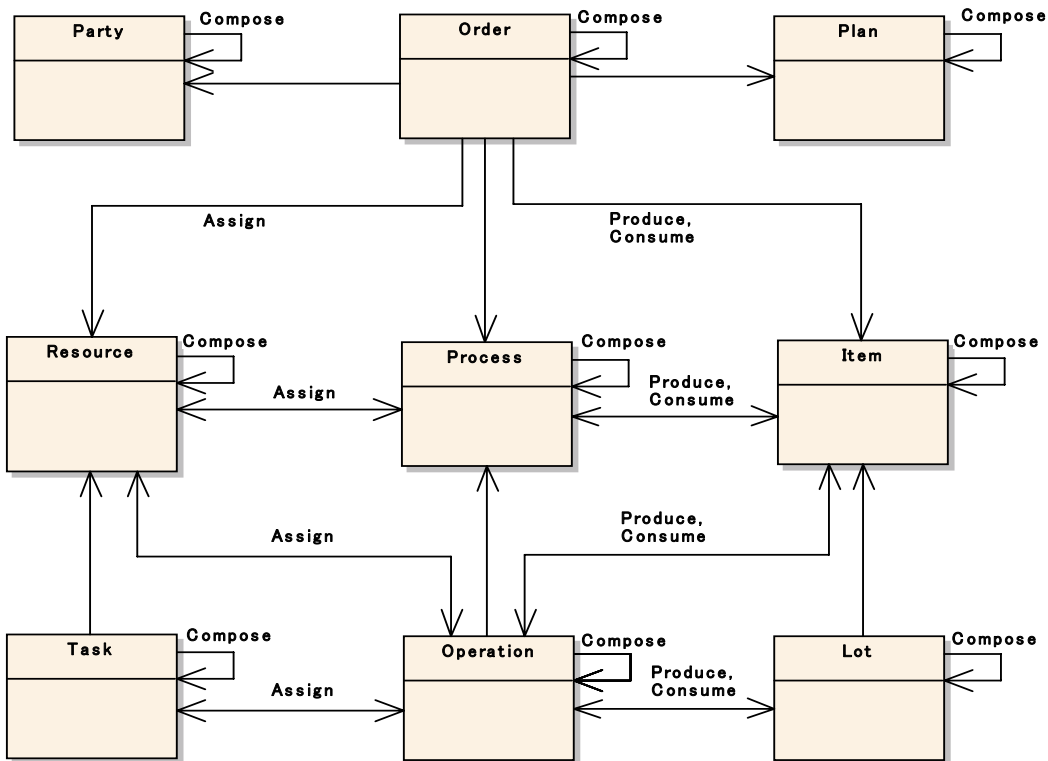
818 Example: 2 months later since the present month (May, 2005) (discrete time scale)

```
819 <Time count="2" unit="month" base="2005-05-01T00:00:00"/>
```

820

821 **A. Object Class diagram**

822 Figure A-1 shows the structure of primitive objects in this specification with UML class diagram. Each
823 object corresponds to each XML element. In this figure, arrows represent the source and destination
824 between the referring objects. When an arrow has role names, it corresponds to an independent XML
825 element associating the two objects. This figure doesn't include all the information of XML schema but the
826 information on primitive elements.
827



828
829 Figure A-1: Primitive objects for representing planning and scheduling problems
830

831 **B. Cross reference of elements**

832 The below table B-1 shows the relations between elements. The horizontal lines represent parent
 833 elements and the vertical lines represent child elements. Symbol * in the table means 0 or more than 0
 834 element.

835
 836 Table B-1 Element and sub-element relations

	Compose Produce Consume Assign Relation	Location Capacity Progress Spec	Start End Event	Price Cost	Priority Display Description Author Date	Qty Char Duration Time
Party	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Plan	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Order	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Item	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Resource	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Process	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Lot	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Task	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Operation	* * * * *	* * * * *	* * * *	* *	* * * * *	* * * * *
Compose		* * * * *	* * * *	* *	* * * * *	* * * * *
Produce		* * * * *	* * * *	* *	* * * * *	* * * * *
Consume		* * * * *	* * * *	* *	* * * * *	* * * * *
Assign		* * * * *	* * * *	* *	* * * * *	* * * * *
Relation		* * * * *	* * * *	* *	* * * * *	* * * * *
Location			* * * *	* *	* * * * *	* * * * *
Capacity			* * * *	* *	* * * * *	* * * * *
Progress			* * * *	* *	* * * * *	* * * * *
Spec			* * * *	* *	* * * * *	* * * * *
Start					* * * * *	* * * * *
End					* * * * *	* * * * *
Event					* * * * *	* * * * *
Price					* * * * *	* * * * *
Cost					* * * * *	* * * * *
Priority						* * * * *
Display						* * * * *
Description						* * * * *
Author						* * * * *
Date						* * * * *
Qty						
Char						
Duration						
Time						

837
 838
 839

840 The following table B-2 shows the correspondence between elements and attributes. The horizontal lines
 841 show element names and the vertical lines show attribute names. The characters in the table represent
 842 data types. The letters in the table are used as follows: "U" for identification character of element, "P"
 843 for an identification character of other elements, "S" for the character string, "F" for a decimal number, "N"
 844 for an integer number, "T" for date time, "D" for duration and "B" means that the value is "true" or "false".
 845 Boldface means required information.

	id	key	name	parent	type	status	value	condition	relative	disjunctive	exclusive	count	unit	base	party	plan	order	item	resource	process	lot	task	operation
Party	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Plan	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Order	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Item	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Resource	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Process	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Lot	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Task	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Operation	U	N	S	P	S	S									P	P	P	P	P	P	P	P	P
Compose	U	N	S		S		S			B					P	P	P	P	P	P	P	P	P
Produce	U	N	S		S		S			B					P	P	P	P	P	P	P	P	P
Consume	U	N	S		S		S			B					P	P	P	P	P	P	P	P	P
Assign	U	N	S		S		S			B					P	P	P	P	P	P	P	P	P
Relation	U	N	S		S		S			B					P	P	P	P	P	P	P	P	P
Location	U	N	S		S	S	S		B														
Capacity	U	N	S		S	S	S		B														
Progress	U	N	S		S	S	S		B														
Spec	U	N	S		S	S	S		B														
Start	U	N	S		S	S	S	S			B												
End	U	N	S		S	S	S	S			B												
Event	U	N	S		S	S	S	S			B												
Price	U	N	S		S	S	S	S			B												
Cost	U	N	S		S	S	S	S			B												
Priority			S		S		S	S			B												
Display			S		S		S	S			B												
Description			S		S		S	S			B												
Author			S		S		S	S			B												
Date			S		S		S	S			B												
Qty			S		S	S	F	S			B	N	S	F									
Char			S		S	S	S	S			B	N	S	S									
Duration			S		S	S	D	S			B	N	S	D									
Time			S		S	S	T	S			B	N	S	T									

846
 847 Table B-2 Element and attribute relations
 848

849

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865

D. Revision History

866

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867

868