

Introduction of PSLX: Planning and scheduling standard

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Yasuyuki Nishioka

PSLX Consortium / Hosei Univ.

Outline

1. Introduction
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3. Terminology
4. Activities and Systems Requested
5. Object Model
6. XML Schema

Introduction

Problems on planning and scheduling

- MPS can not follow the detail production schedule that becomes critical in a short term supply chain.
- Types of alliance with customers become more complicated in terms of order processing and shipping management.
- Detailed production scheduling is hard to have capability by itself to maintain the latest data of products and processes.
- Scheduling system on computers has not been welcomed by plant floor operators because of its flexibility and reliability.

PSLX Consortium

What is PSLX?

- Reference Architecture for APS software development
- Communication Protocols and Ontology among APS software
- XML Schema for Planning and Scheduling Data Communications
- Common Model and Terminology of Planning and Scheduling problems

PSLX (Planning and Scheduling Language on XML specification)

PSLX Consortium history

- Founded in July 2001 by Prof. Yasuyuki Nishioka with IT vendors and manufacturers.
- Five sub committees were activated in Sep 2001
- White paper is published in March 2002
- Four vendors developed first demo version of schedulers in March 2002
- Engineering specifications are published in March 2003
- Presentation at ISO TC184/SC5 in April 2003
- OASIS accepted to establish PPS TC in Oct 2003

Corporate Members (51)

Asprova Corporation
KOZO KEIKAKU Engineering Inc.
Toyo Engineering Corporation
e-Manufacturing Co.,Ltd.
M-2-M Inc.
ISAC, Inc.
EXA Corporation
JT Engineering inc.
CIMTOPS Corporation
CANON SYSTEM SOLUTIONS INC.
NS Solutions Corporation
Yokogawa Information systems Corporation
NEC Nexsolutions Ltd
APPLIED TECHNOLOGY Co.,Ltd
LOGIX JAPAN Co.,Ltd.
Hitachi Ltd.
NEXTECH CORPORATION
Fujitsu Limited
Hitachi Engineering Co.Ltd
Hitachi East Japan Solutions, Ltd.
Kawatetsu Systems, Inc.
AlphaPurchase Co.,Ltd.
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MASP Association
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Hitachi Information & Control Systems,Inc.
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CIMX Co.,Ltd
Yokogawa Electric Corporation
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Tohoku University
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Japan Society for the Promotion of Machine Industry
Greater Tokyo Initiative
JGC Corporation
CLASS TECHNOLOGY CO.,LTD
OMRON Corporatin
CIM TECHNOLOGY CO.,LTD.

PSLX Recommendations

- PSLX-01 : Grand Design for Manufacturing Enterprises
- PSLX-02 : APS Agent models
- PSLX-03 : PSLX Domain Objects
- PSLX-04 : XML Specification and Data Exchange
- PSLX-05 : PSLX Common Dictionary

		01	02	03	04	05
Level 5	Business model layer	✓				✓
Level 4	Collaboration layer	✓	✓			✓
Level 3	APS agent layer		✓	✓	✓	✓
Level 2	Domain object layer		✓	✓	✓	✓
Level 1	Data implement layer				✓	

Terminology

Terminology (1)

- **Item**
 - Significant object that is produced or consumed by production activities
- **Resource**
 - Functional capacity that is necessary to carry out production activities
- **Operation**
 - Class of specific activities of production

Terminology (3)

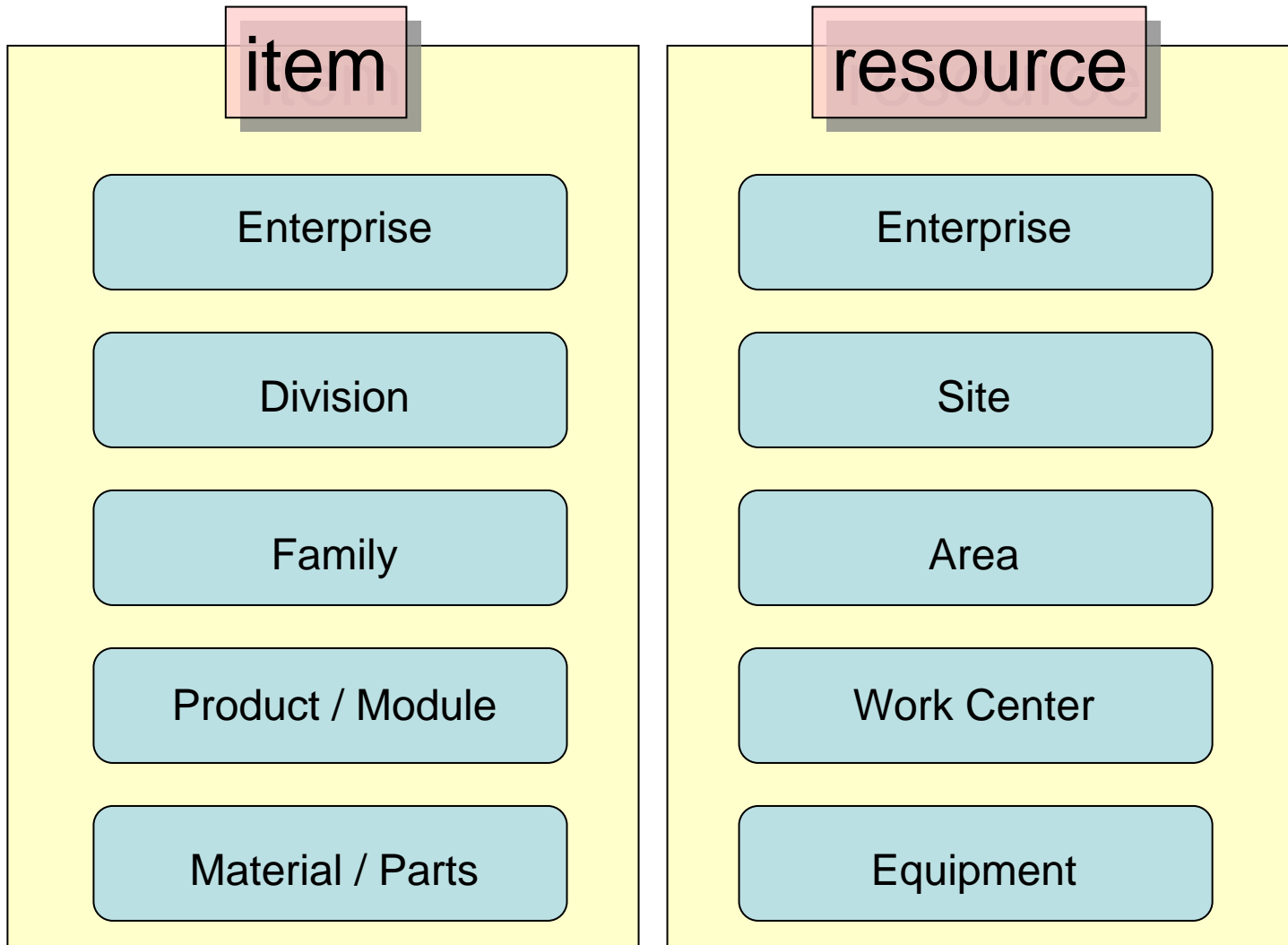
- **Product**
 - Items that are requested by orders coming from out of the decision making unit
- **Service**
 - Resources that are requested by orders coming from out of the decision making unit
- **Process**
 - Operations that are requested by orders coming from out of the decision making unit

Terminology (4)

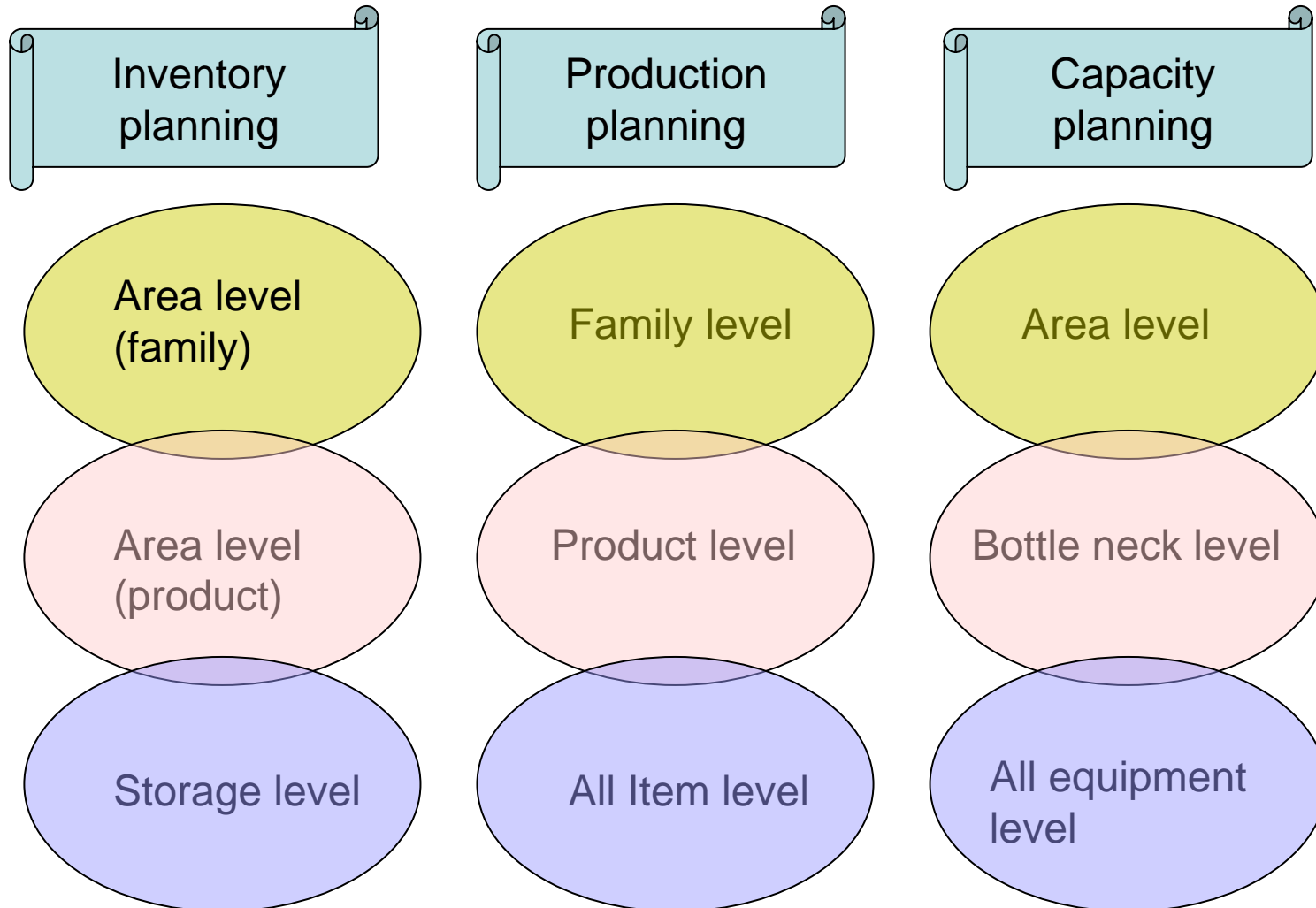
- **Order**
 - Actual requirements for products, services or processes, which have a certain time and place
- **Customer**
 - Parties who send orders coming from out side of the decision making unit
- **Supplier**
 - Parties who receive orders going out side of the decision making unit

Activities and Systems Requested

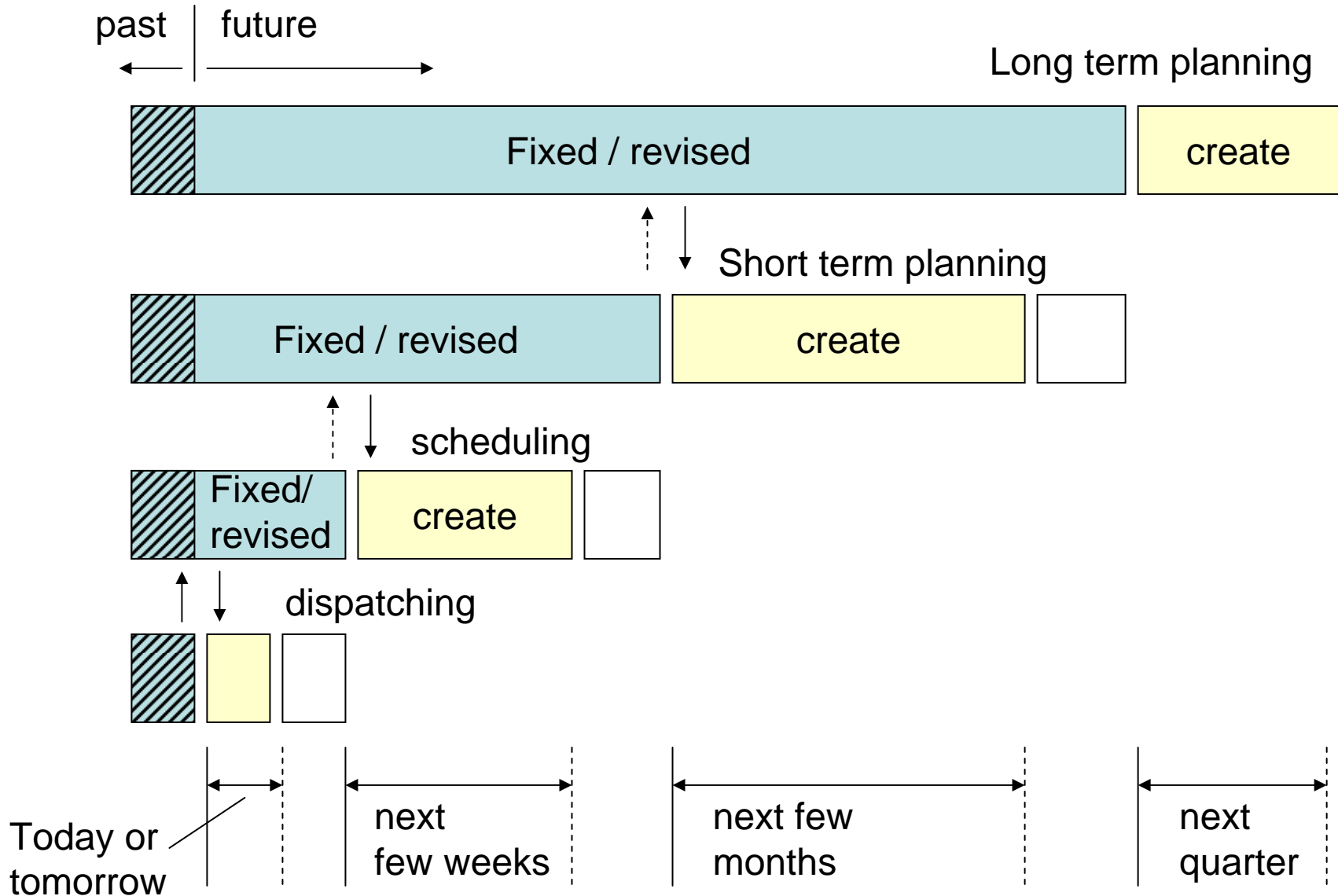
Items and resources hierarchy



Decision hierarchy in planning



Planning and scheduling hierarchy



Object Model

Modeling Essence

- Distinction between production items and resources that correspond products and services respectively
- Considering both planning and scheduling by dealing both with continuous time scale and discrete time scale
- Occurrence data such as dispatch, lot and task all of which are activated by orders for each situation
- Self hierarchy reference of each object to adjust an aggregate level from scheduling to planning and vice versa

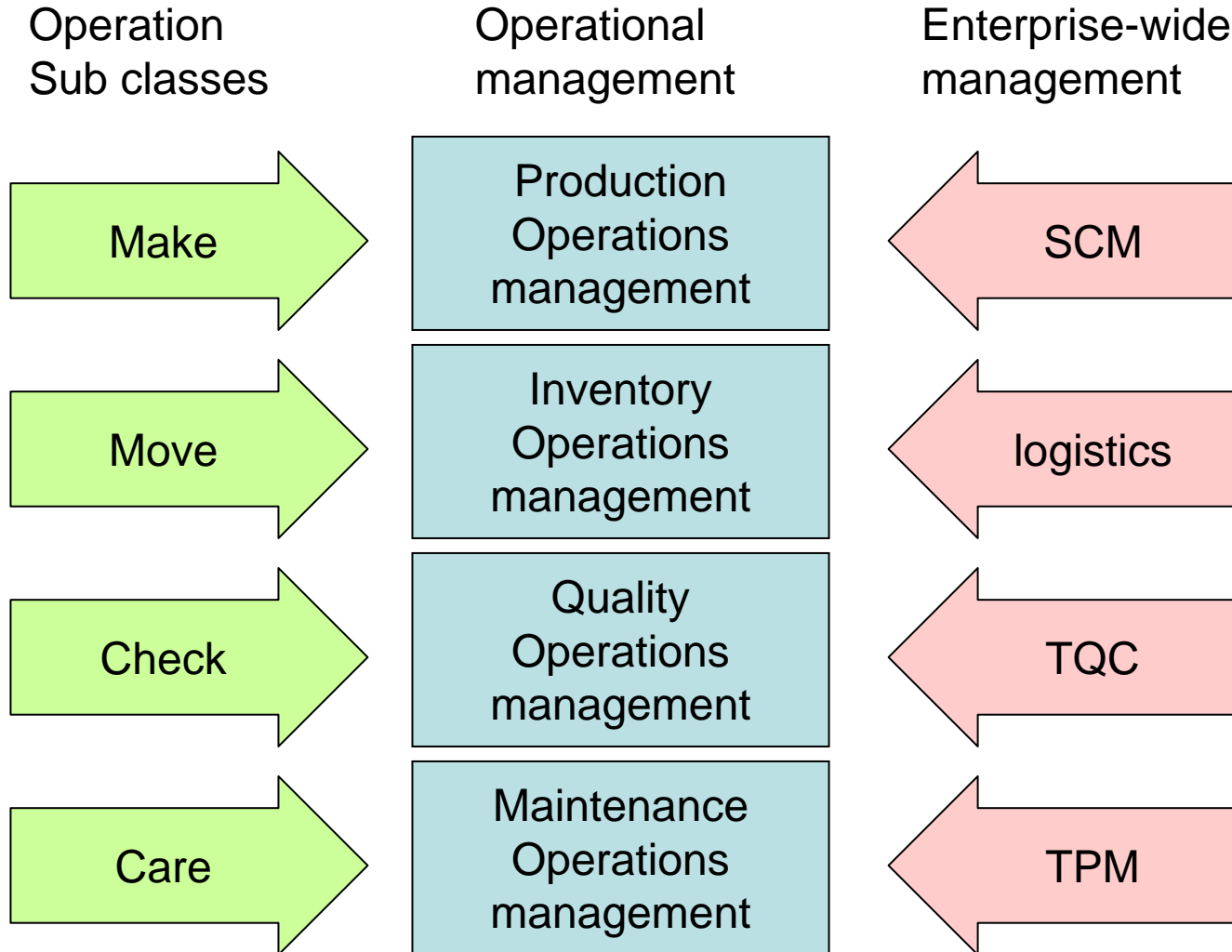
Order sub classes

- Prospective orders
 - are created inside of an enterprise with respect to the future demand
- Customer orders
 - are provided by customers to request a particular product or services by a certain due date.
- purchase orders
 - are created for procurement division parts or materials that cannot be made in the enterprise
- production orders
 - are actual requirements of production activities that are aggregated for each production area
- work orders
 - deal with detail production in a shop floor layer due to the other orders such as production orders

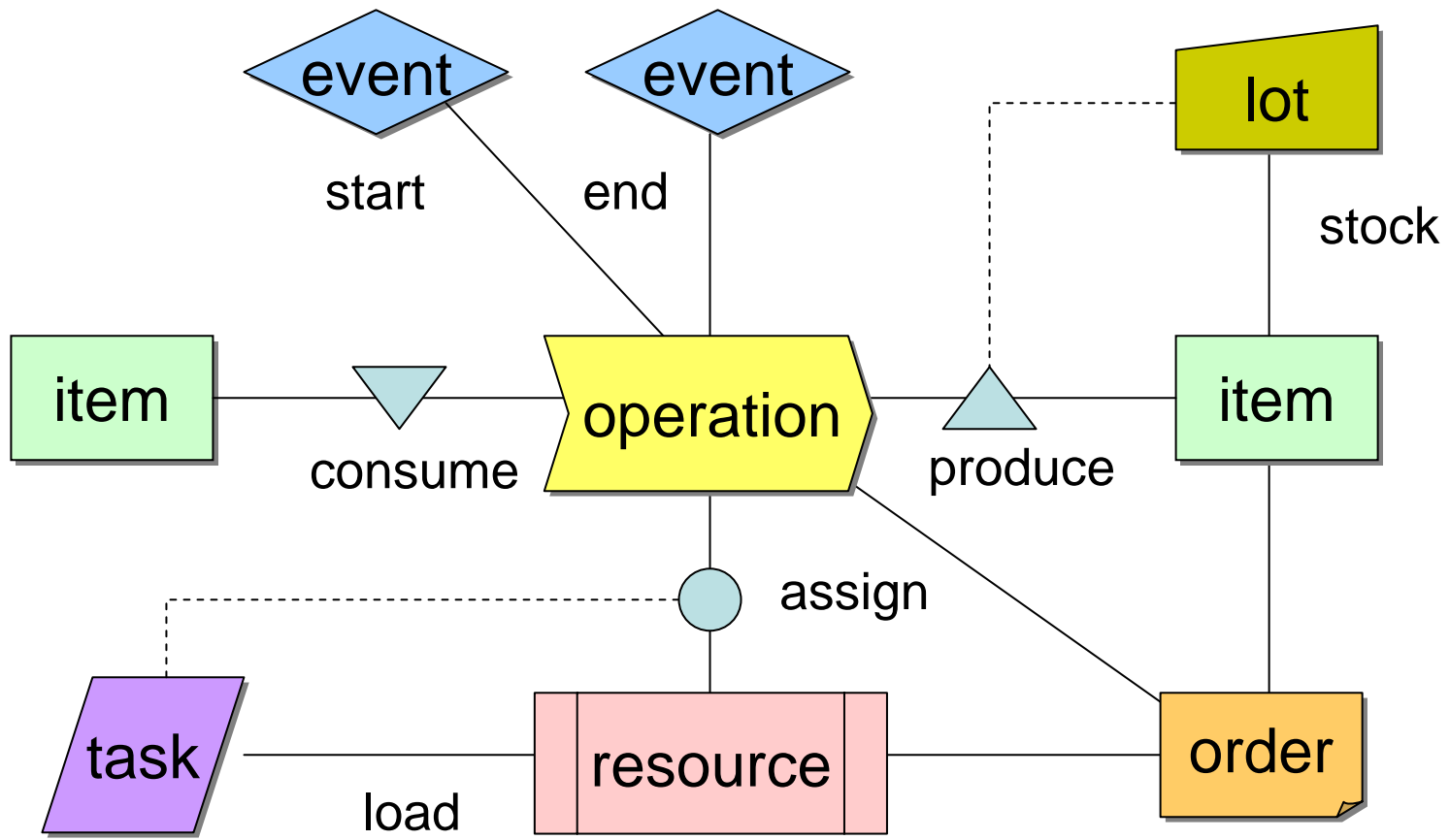
Operation sub classes

- **Make**
 - Operations that change physical properties of items
- **Move**
 - Operations that change spatial and/or temporal properties of items
- **Check**
 - Operations that change reliability of quality on items
- **Care**
 - Indirect Operations that make, move and/or check resources

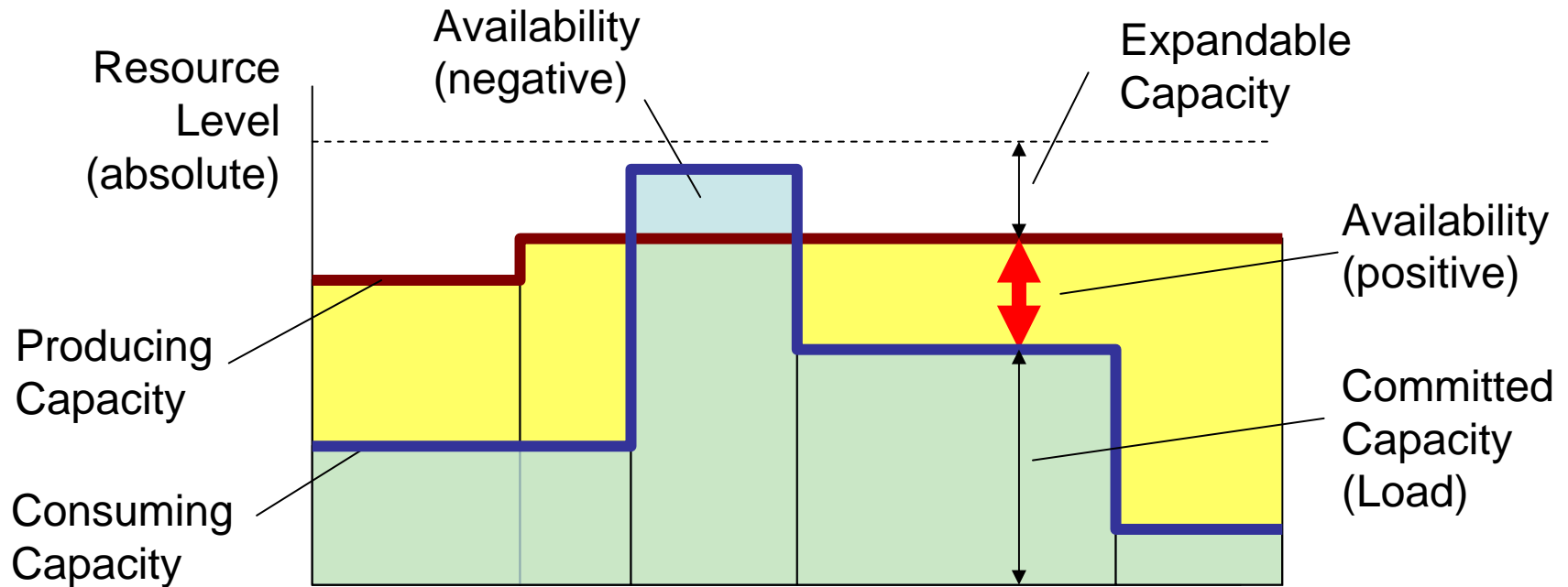
Basic modules of operations management



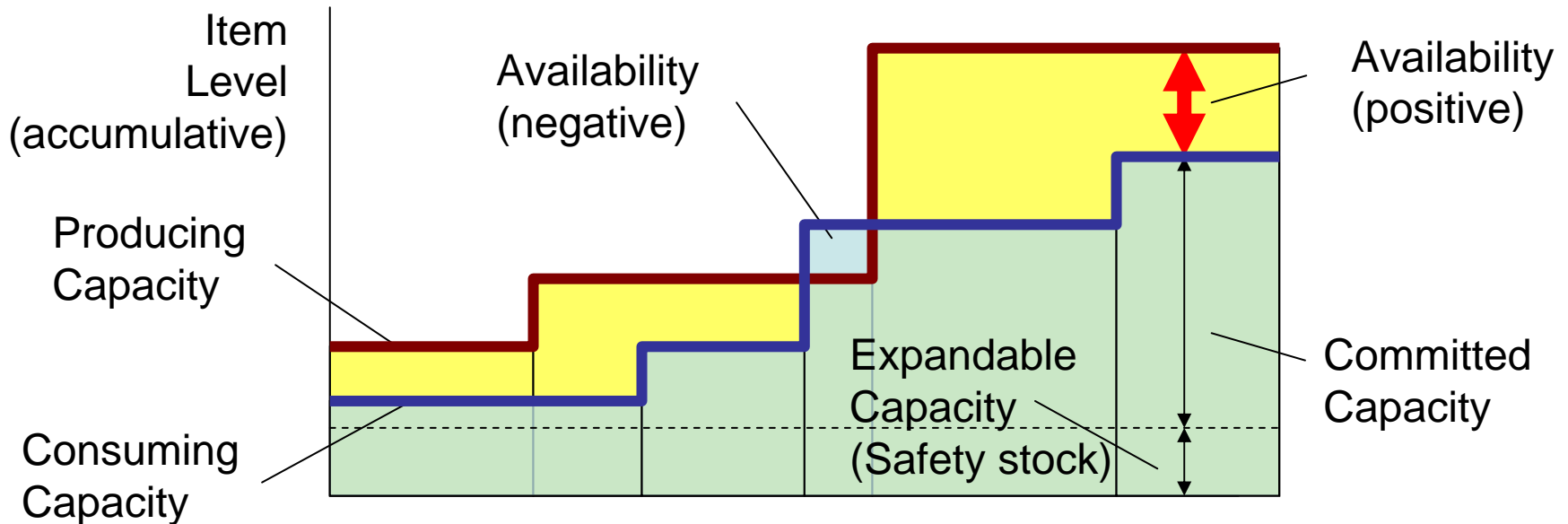
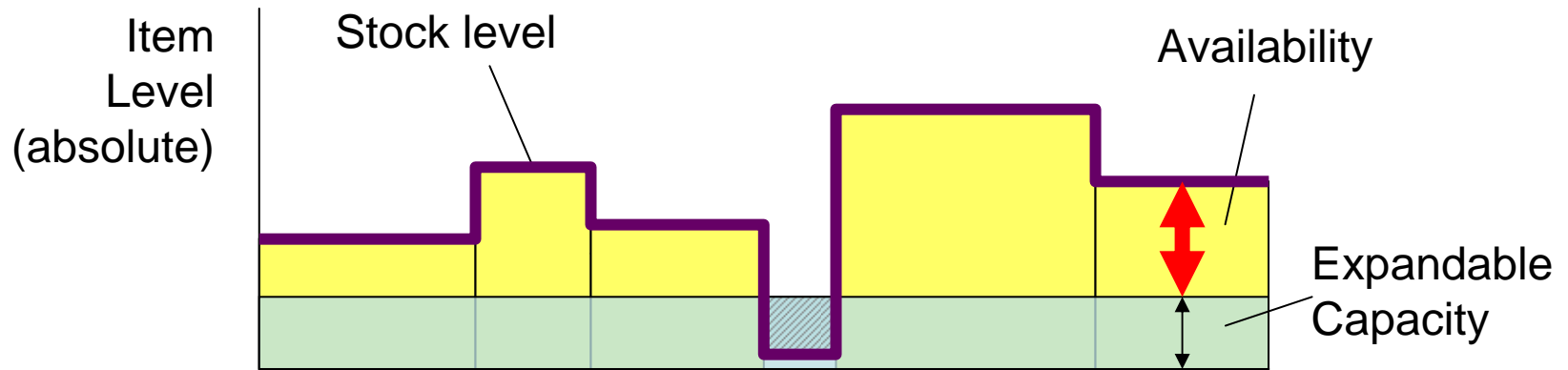
Primitive objects in production



Resource capacity and availability



Item capacity availability



XML Schema

OASIS PPS Schema

- Administrative Elements (2)
 - <scale> <stone>
- Primitive Elements (9)
 - <customer> <supplier> <item> <resource>
<operation> <order> <dispatch> <lot> <task>
- Administrative Properties (3)
 - <description> <priority> <display>
- Relational Elements (10)
 - <produce> <produced> <consume> <consumed> <assign> <assigned>
<predecessor> <successor> <pegging> <partof>
- Property Elements (7)
 - <spec> <location> <progress> <load> <stock> <available> <calendar>
- Temporal Elements (5)
 - <start> <end> <release> <duetime> <event>
- Basic Data Elements (5)
 - <qty> <price> <char> <duration> <time>
- Data Auxiliary Elements (7)
 - <min> <max> <earliest> <latest> <shortest> <longest> <enumerate>

Example of time description

Continuous time scale

```
<dispatch name="K03-01" operation="K03">  
<start><time value="2004-08-09T12:00:00" /></start>  
<end><time value="2004-08-09T14:15:00" /></end>  
</dispatch>
```

Discrete time scale

```
<scale name="S1" value="P1W" base="2004-08-09T00.00.00"/>  
<resource name="R01">  
<load><qty value="100"/><time scale="S1" count="1"/></load>  
<load><qty value="130"/><time scale="S1" count="2"/></load>  
</resource>
```

Thank you !

nishioka@k.hosei.ac.jp

<http://www.pslx.org>