

The Perspective of B2MML Based on Implementation

Feng Wang^{1, a}, FuCheng Pan^{1, b}, Peng Li^{1, c}

¹Research Laboratory of Digital Factory, Shenyang Institute of Automation, Chinese Academy of Science, Shenyang, 110186, China

^aemail: wangfeng1@sia.cn, ^bemail: pfc@sia.cn, ^cemail: pengli@sia.cn

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Abstract. The B2MML[1] (Business To Manufacturing Markup Language) based on XML[2] is an implementation of communication specification, to exchange text information. Based on Web Service and ISA95[3], B2MML technology was designed and implemented into as a MES integration interface scheme. The scheme is with the advantage of high efficiency, multi-platform, cross-regional data interface, low cost, good openness and extensibility.

To offer support for B2MML studies, this paper elaborate the concept and operational mechanism of MES[4-6], ERP and ISA95 standards. The meaning and function of those were summarized. The motivation and necessity for B2MML are discussed from the aspects of theory, applications and the system control. The definitions, technical concepts, implementations of B2MML are described in this paper.

Finally, the development prospect and corresponding suggestions about this Language are also explored and discussed in detail.

MES

MES (Manufacturing Execution System) is a set of production information management systems for manufacturing enterprise workshop executives. MES can provide enterprises with manufacturing data management, project schedule management, production scheduling, inventory management, quality management, human resource management, work equipment, tools, equipment management, procurement management, cost management, monitor management, production process control. MES is an information systems that reside on the plant floor between the upper planning systems in offices and industrial controls in the production manufacturing management process, which has been the mainstream technology on the product management and the plant floor control.[8]

MES is helpful for an enterprise to build a solid, reliable, comprehensive and feasible manufacturing collaborative management platform, ensuring the continuity of information flow in the enterprise.

ERP

ERP (Enterprise Resource Planning), Gartner Group company posed in 1990 in the United States. In addition to manufacturing resource planning, manufacturing, finance, marketing, purchasing and other functions existing in the MRP II, quality management, laboratory management, business process management, product data management, inventory, distribution and transportation management, human resources management and reporting system on a regular basis. By far, the meaning of ERP includes all kinds of software enterprises. It jumped out of the traditional enterprise boundaries, from the scope of the supply chain to optimize enterprise resources, is a new generation of information system based on network economy era. It is mainly used for improving enterprise business processes in order to improve enterprise core competitiveness.

ISA95

In fact, different manufacturers have different production management applications. Programs are provided by different suppliers, which making the integration work become more complex, and raise the cost of implementation and maintenance work. Especially for a common model, it is necessary to have a common terminology and understanding to support it. ISA-95 standard, defines the functional view of the enterprise, improve the situation.

ISA-95 standard defines the terms and models used in the MES system integrating .The standard is set by the ISA (International Standards Authority) and ANSI (American National Standards Institute) launched. In order to develop an efficient MES system, it is necessary to define software proper functions, physical model, business process and production process. From this perspective, the ISA - 95 standard is the simple production activities through the model used in the main manufacturing area. The final model is more broad than other ones. Both in the introduction to demand to use terminal customers, and suppliers to use in the system description, the model specification and specific enough. ISA-95 standard is to reduce the risk, cost, reduce the mistakes of the system in the implementation of enterprise and manufacturing operations, simplify the operation, ease of integration.

According to the ISA-95 standards, manufacturing operations management activities including production, maintenance, quality, and the inventory management. ISA-95 specification requirements are aimed to encourage the use of common terminology and model, namely software vendors are encouraged to offer clients products and frame in standard reference model.

ISA-95 proposes a hierarchical model of the manufacture enterprise , classify it into five levels. Part 3[7] lists the functions of each level, and finally get a complete functional level model[7,8].

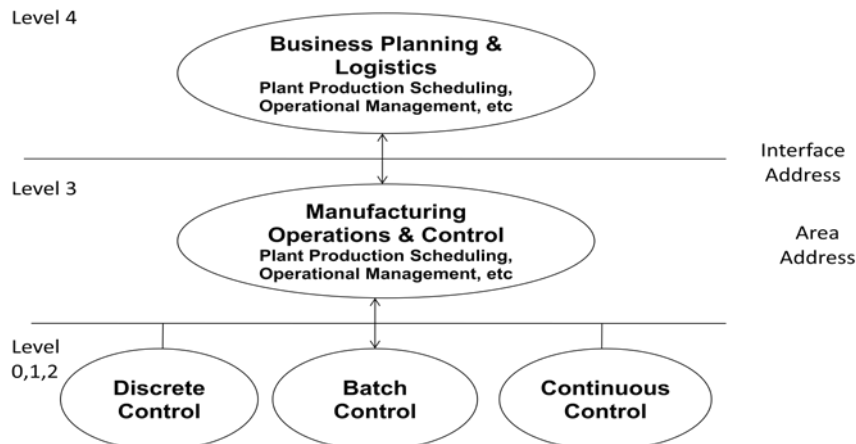


Figure.1 The hierarchical model of the manufacture enterprise

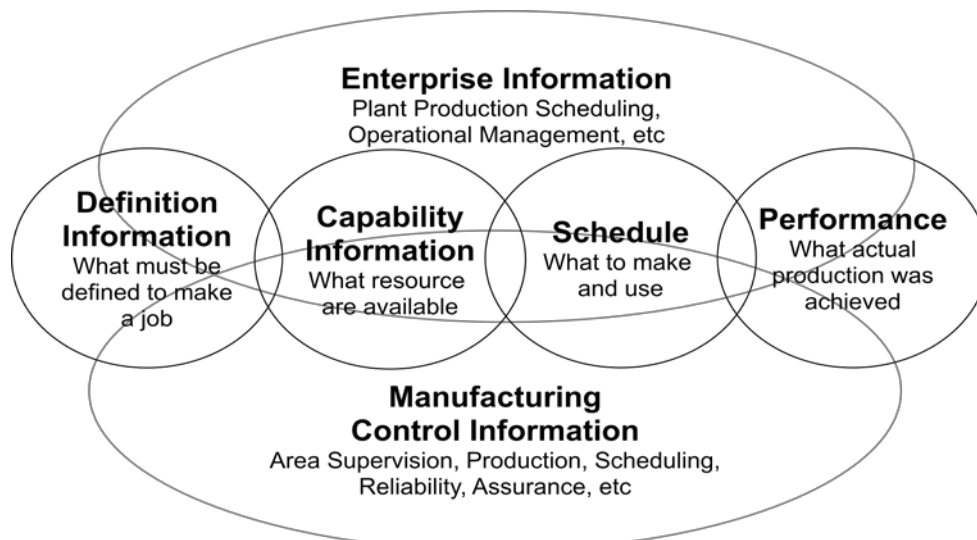


Figure.2 Categories of information exchange in ISA95

B2MML

Extensible Markup Language (XML) is a language that defines a set of rules for encoding documents in a both human-readable and machine-readable format. The specification and several other related specifications-all of them free standards XML. The design goals of XML pursues simplicity, generality and usability across the computer science. It is a textual data format with strong support for different human and machine languages. Although the design of XML focuses on text, the language is widely used for the representation of arbitrary data structures such as those used in web services.

B2MML (Business To Manufacturing Markup Language) is an XML imply of the ANSI/ISA-95, Enterprise-Control System Integration, family of standards (ISA-95). Any group may use B2MML royalty free, provided credit is given to MESA. B2MML V0600 is the latest version. Earlier versions are still available;

B2MML consists of a set of XML schemas written in the World Wide Web Consortium's XML Schema language (XSD) that implement the data models in the ISA-95 standard. Companies interested in following ISA-95 for integration projects may use B2MML to integrate business systems such as ERP and supply chain management systems with manufacturing systems.^[9] B2MML is such a good implementation, that which enable integration project teams to use ISA-95 during analysis and design, and then use XML during implementation.

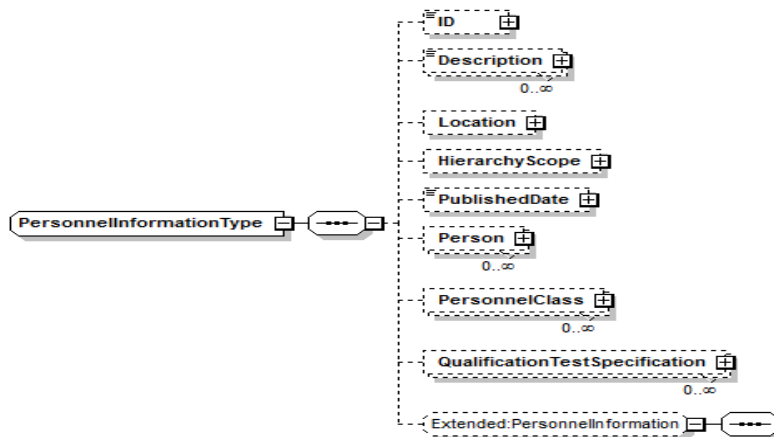
B2MML defines four kinds of schemas: production schedule schema, product definition schema, process segment schema, production capability in the information of work flow. It describes resources and information flow of standard definition of enterprise control system. It also defines the data content and format exchanged among enterprise control systems. Different application system can make use of specification data a unified, clear meaning label. The same data can be used in different systems in various demand for reuse, achieving the goal of information sharing between systems.

Development tendency

1. Targeted. In theory, B2MML must be interpreted easily to get the target information. A B2MML text can convey a large handle of data in a complex manner to control the complexity of the production process. The message is so large that device has to search for the important part. It needs not just to get the data, but to be able to analyze the data easily. When an abnormal event occurs in the workshop, the message should be responded in a short time. The new generation B2MML should be more convenient to carry out the production process and control, more accurate, more timely. Machine and people can obtain more emergent data in real time without checking and interpreting of extra process.[10] Device can make quick decisions in spite of multi source information fusion and complex information.

2. Extensive. The integration scope of the new MES system and ERP is more extensive[7], covering the whole enterprise business process. Before designing B2MML, we must grasp three aspects. First, determine the user's identity and authority of the system. Second, ascertain the type of information of each user, the frequency of the message and the format of the message. Third, the communication plan may change as the system transform and personnel changes. The system should be flexible.

3. Integration. The detail of B2MML messages between MES and ERP are designed before other B2MML messages. In this order, designer provide a part function of B2MML first, and then extend the applications, and implement them overall. The advantage of this method is as the following: The critical part is first to implement to reap experience and information for other implements. In this order we can avoid two main problems: If all the implements are provided contemporarily, the complexity of the implements will increase. The design of overall work is time consuming. It will take a lot of complicated design and test certification; Some users need various architectural patterns. Once part of the system changed a little, the enterprise completely needs a new application.



```
<xsd:element name="PersonnelInformation" type="PersonnelInformationType">
<xsd:complexType name="PersonnelInformationType">
  <xsd:sequence>
    <xsd:element name="ID" type="IdentifierType" minOccurs="0"/>
    <xsd:element name="Description" type="DescriptionType" minOccurs="0"
      maxOccurs="unbounded" />
    <xsd:element name="Location" type="LocationType" minOccurs="0"/>
    <xsd:element name="HierarchyScope" type="HierarchyScopeType"
      minOccurs="0"/>
    <xsd:element name="PublishedDate" type="PublishedDateType"
      minOccurs="0"/>
    <xsd:element name="Person" type="PersonType" minOccurs="0"/>
    <xsd:element name="PersonnelClass" type="PersonnelClassType"
      minOccurs="0" maxOccurs="unbounded"/>
    <xsd:element name="QualificationTestSpecification"
      type="QualificationTestSpecificationType" minOccurs="0"
      maxOccurs="unbounded"/>
    <xsd:group ref="Extended:PersonnelInformation" minOccurs="0"/>
  </xsd:sequence>
</xsd:complexType name>
```

Figure.3 An example of personnel schema of B2MML

4. Associativity. B2MML is connecting to new rising subject. At present, MES has made a lot of achievements in theoretical and implementation. But in recent years, cloud manufacturing, manufacturing, manufacturing services, networking, and the Industry 4.0 are proposed and applied[11]. B2MML is not a single technique only in the implementation of MES and ERP, but supports networked collaborative manufacturing. B2MML builds real-time information interconnection among different locations, making the enterprise production and management to achieve synchronization. In all kinds of new concept environments, the depth and width of B2MML implements will be more developed.

Conclusion

MES and ERP play critical roles in enterprise production management. Under the guidance of production planning, which is produced by the ERP system, the MES gathers real time data, scheduling, monitoring, scheduling, resource allocation, and manufacturing process optimization. B2MML plays an important role in conveying the information between ERP and MES or among the MES.

B2MML based on ISA95, is an implement to convey information. The tendency of B2MML will become targeted, extensive, integrative and associative, to be more efficient and universal. B2MML must have a wide and light future in the intelligent manufacturing.

Understanding the development status of B2MML and grasping its development trend, enterprise production management will get a profound and extensive theoretical value and application value.

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