Manufacturing Software Interoperability and Assurance using Standardized Capability Profiling : An ISO 16100 Proposal

presented by

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Backgrounds

Major changes in the area of manufacturing software systems

➢Trend to the open system architecture from a software embedded type system architecture.

➢Globalization from building a manufacturing system by developing all software units by themselves to building a manufacturing system by combining software units which are provided by various venders.

➢Conversion of the optimization target from local optimization of each system unit to total optimization of the whole manufacturing system.

Key technologies to reduce development time and development cost:

how to find and use skillfully manufacturing software units which are provided by various venders and how to reuse existing software units.

Objectives of ISO 16100

International Standard ISO 16100 :
Manufacturing Software Capability Profiling for Interoperability
developed by ISO/TC 184/SC 5/WG 4

- To provide a standardized mechanism to search for good and proper manufacturing software.

- To provide a standardized mechanism to show the precise capability of the manufacturing software.

- To provide a standardized methodology for the interoperability and assurance of manufacturing software units using capability profiling.

History of ISO 16100 Series

Development of ISO 16100
   1998 Dec.: ISO/TC 184/SC 5 Study Group proposed
         NWI : Manufacturing Software Capability Profiling
   1999 Jun.: New work item proposal was accepted
   2000 Nov.: ISO/TC 184/SC 5/WG 4 started to develop ISO 16100

Title of ISO 16100:
Manufacturing Software Capability Profiling for Interoperability
   Part 1: Framework (editor from USA) 2002
   Part 2: Profiling methodology (editors from Japan) 2003
   Part 3: Interface protocols and templates (editor from Germany) 2005
   Part 4: Conformance test method, criteria and reports
                            (editor from China) 2006
   Part 5: Methodology for profile matching using
        multiple capability class structures
                    (editors from Japan) *under DIS ballot*

Manufacturing Application Model
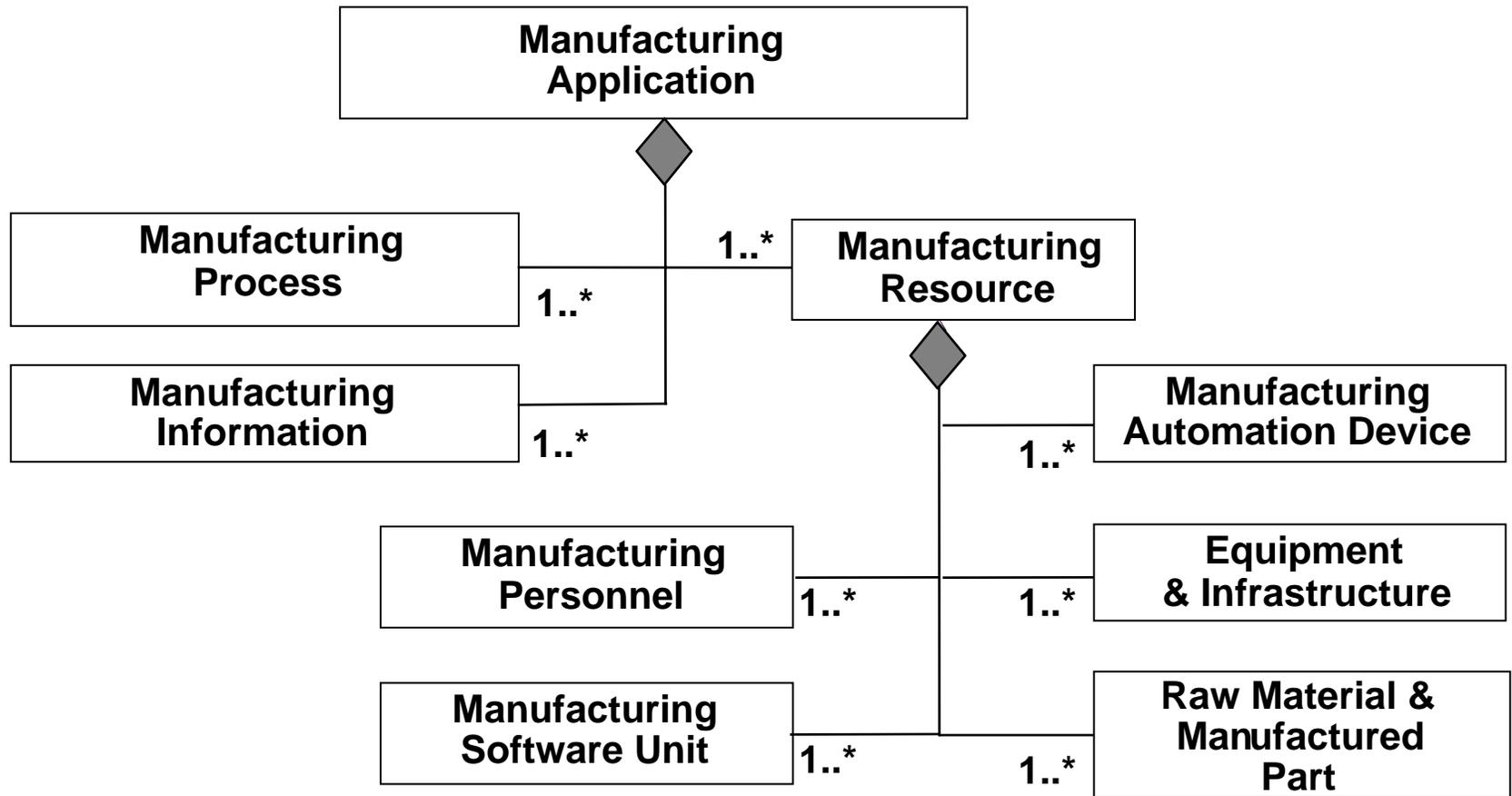
A Manufacturing Software Unit and Its Surroundings
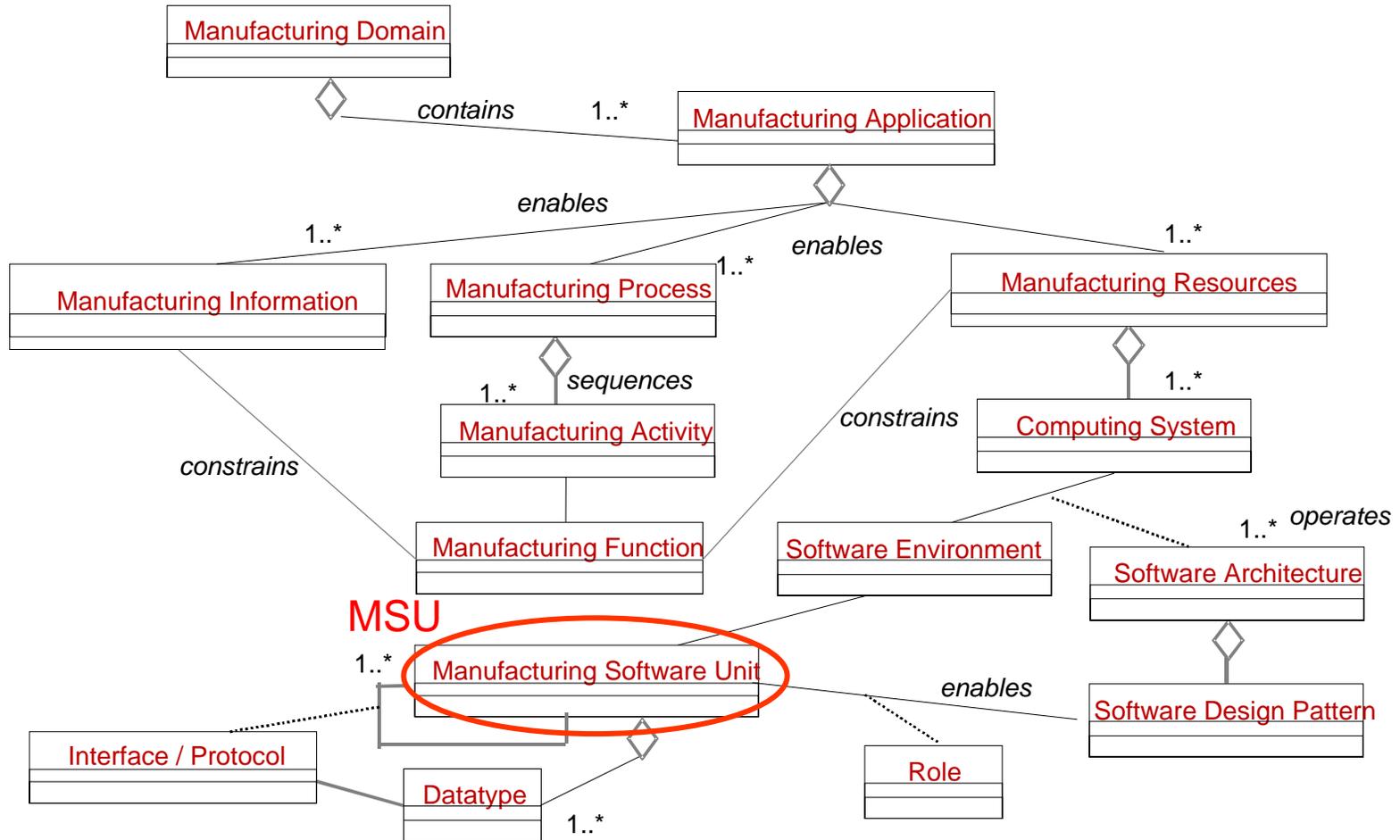
MSU Capability Profiling Based on the Activity Tree
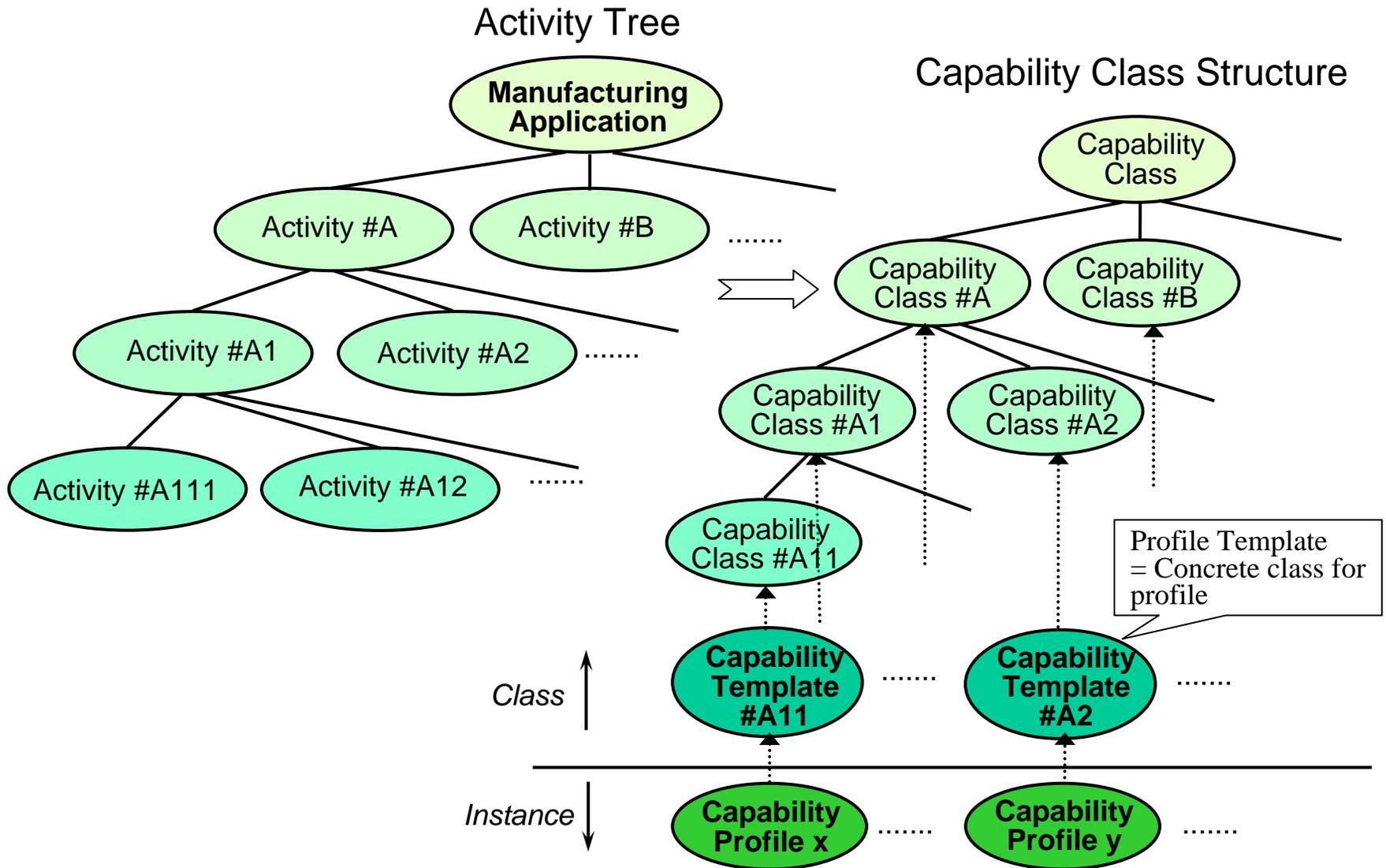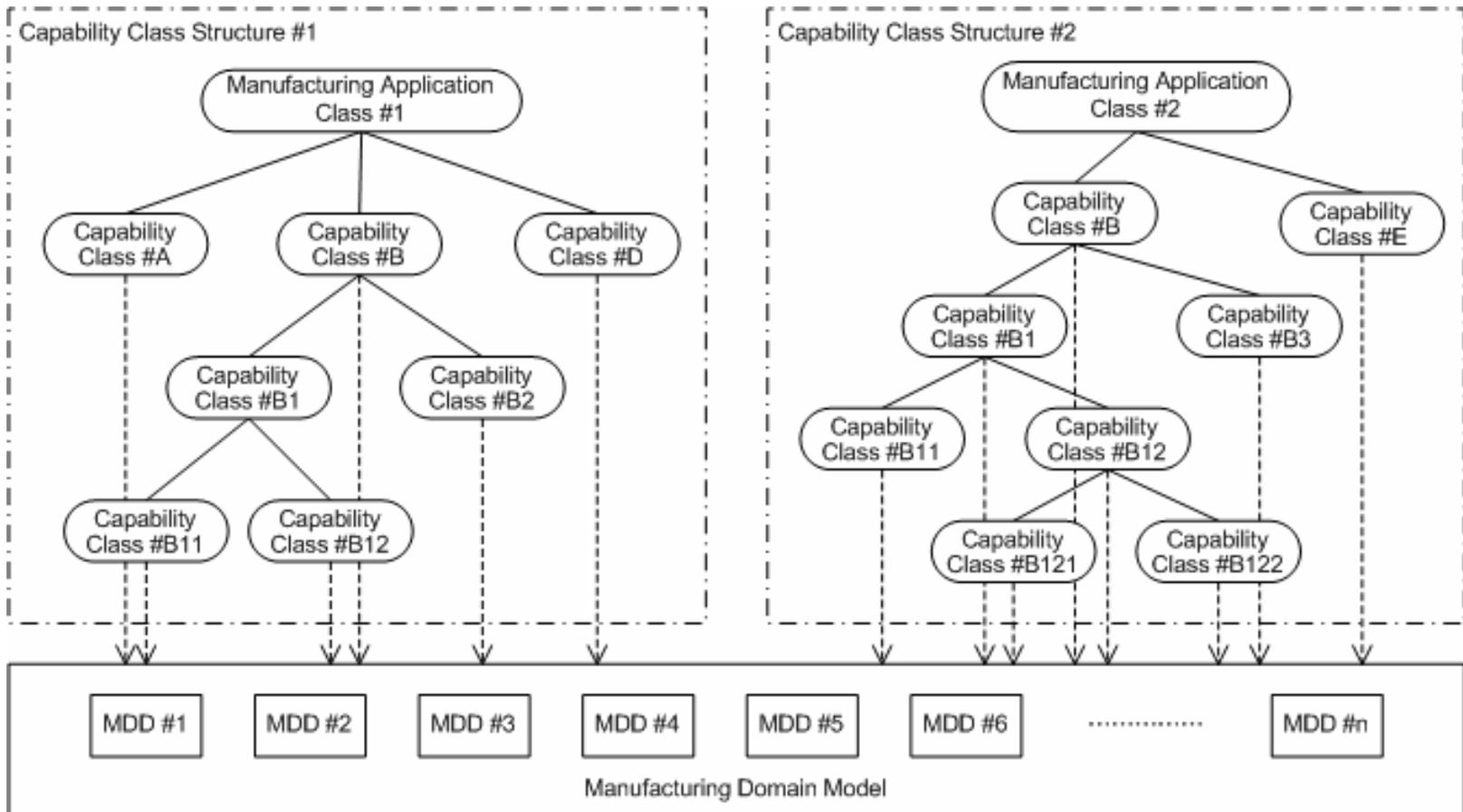
Capability Template and MSU Profile
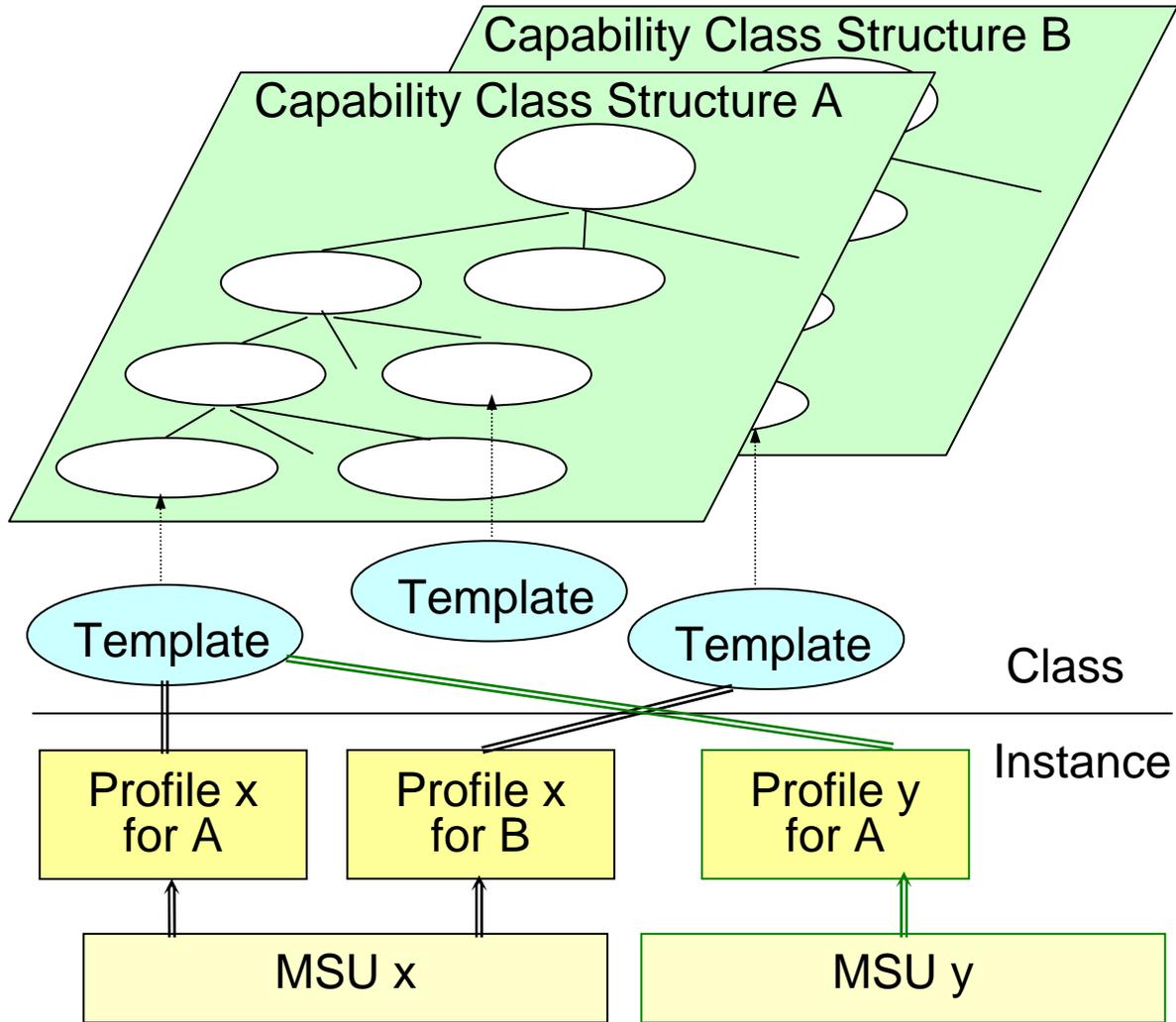
Relationship between manufacturing domain and manufacturing application
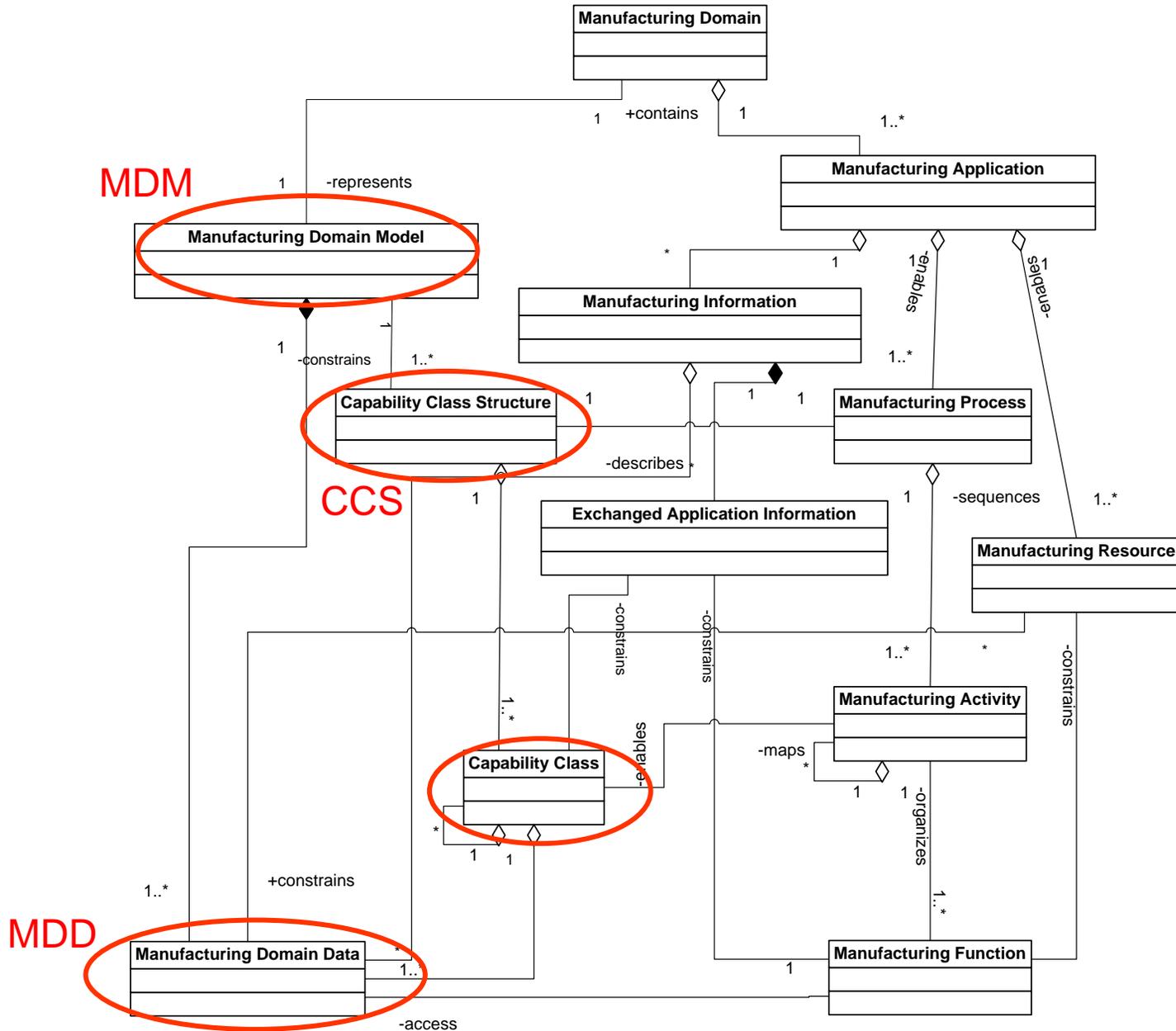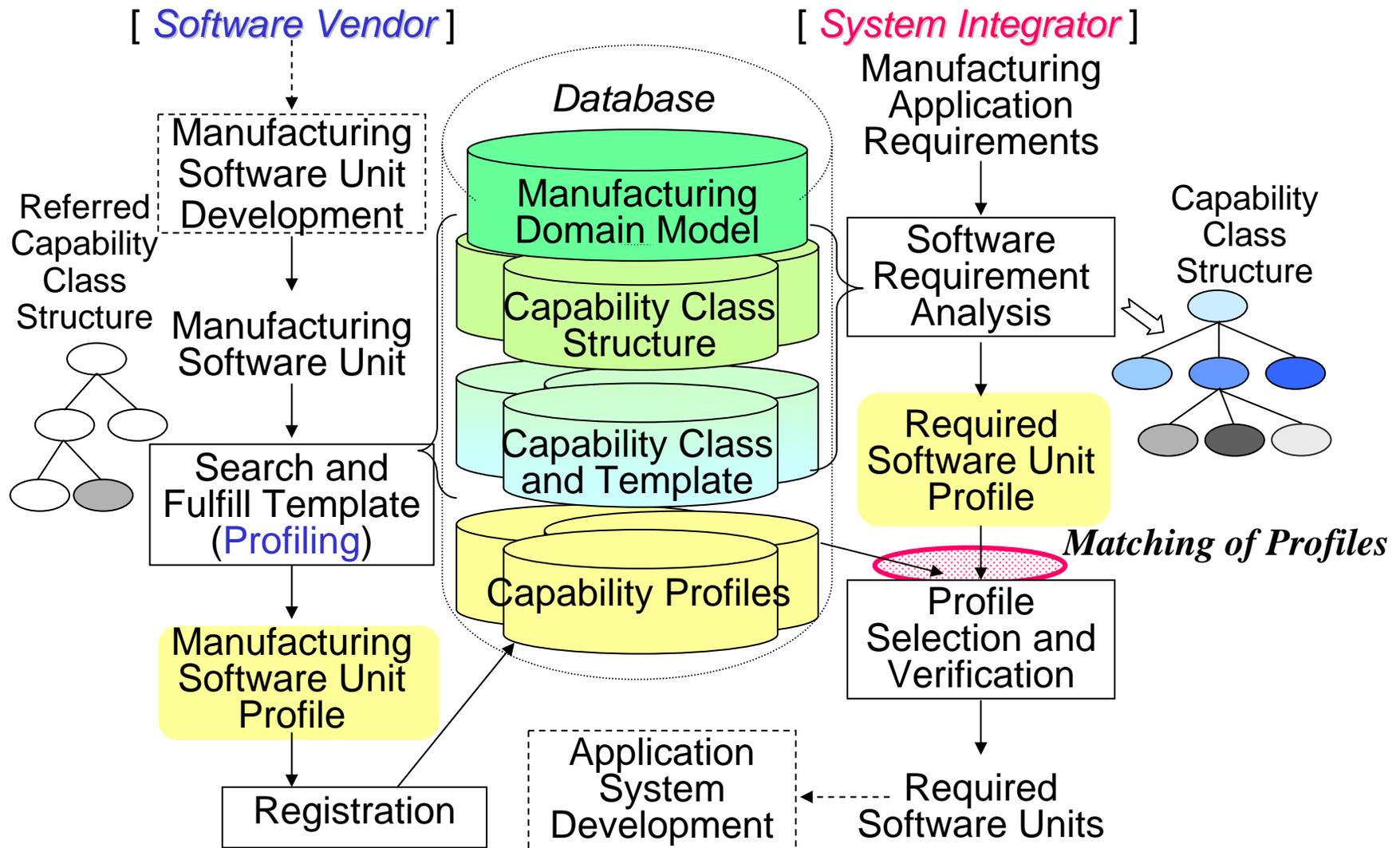
Relationship between MDD and MDM
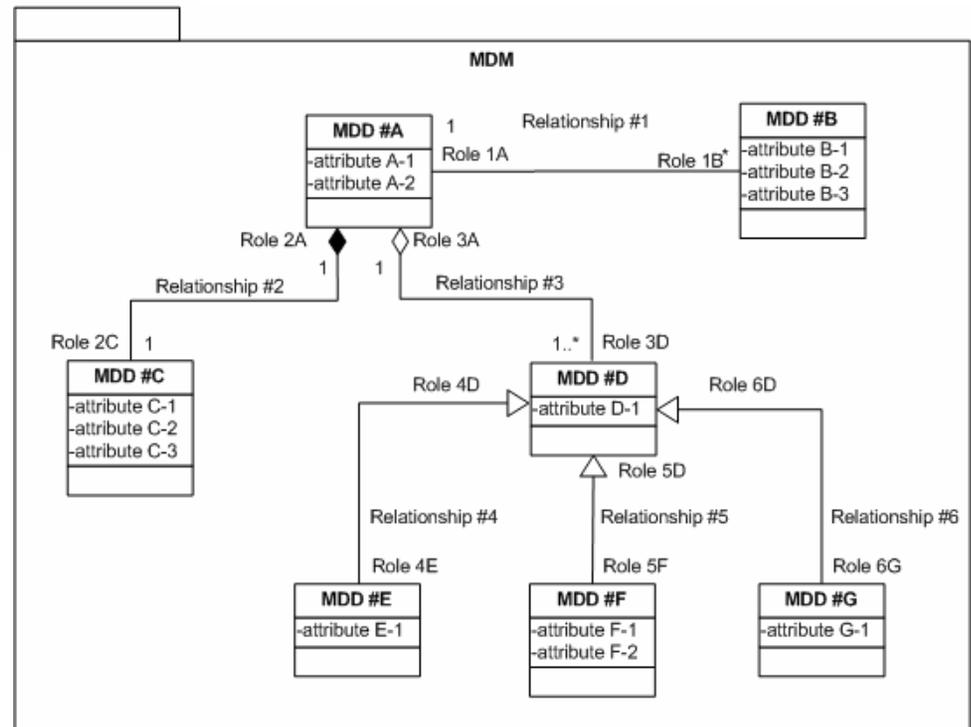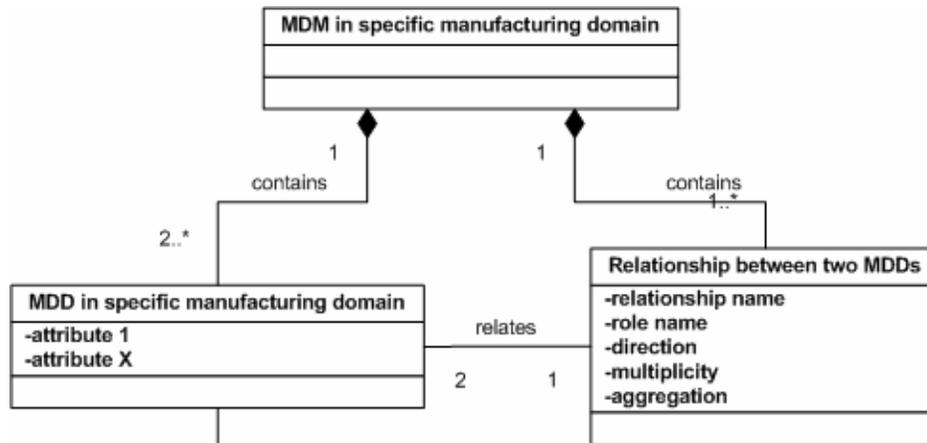
Multiple Capability Classes Described Using MDDs

Conceptual Framework for Interoperability and Assurance

Conceptual Structure of Templates for MSU Capability Profiling

Capability Profile Template

Common Part
- Template ID
- Capability Class Name and **Reference CCS**
- Software Unit ID
    - Vendor Name
    - Version Number & History
    - Computing Facilities Required
        - Processor

- Capability Class Reference Dictionary Name
- Number Of Profile Attributes
- Number Of Methods
- Number Of Resources

Specific Part
- **Reference MDM Name**
- Capability Definition Format
- Capability Definition
    - List of Capability Class Attributes
    - List Of Capability Class Methods
    - List Of Capability Class Resources

MDM Template

- MDM Name
- Domain Reference Dictionary Name
- List of MDD Packages
    - MDD Package
        - MDD Name
        - List of Relationships
            - Relationship
- Relationship Type
    - Relationship Name
    - Destination MDD Name
    - Direction
    - Role Name for MDD
    - Role Name for Destination MDDs
    - Multiplicity
    - Type

MDD Template

- MDD Name
- Reference MDM Name
- List of Attributes
    - Attribute Name
    - Attribute Type

CCS Template

- CCS Creator Name
- CCS ID
- CCS Root Node ID
- Capability Class ID
    - Parent Node ID(s)
    - Child Node ID(s)

Example of MSU Profile

Example of Required MSU Profile

Matching Level in Profile Matching Report

Complete Match — all the manufacturing functions referenced in the required capability profile match completely with all the corresponding functions referenced in the MSU capability profile. This means that both sets of manufacturing functions are fully equivalent in terms of both the MDD objects being equivalent and the time ordering of these objects being equivalent.
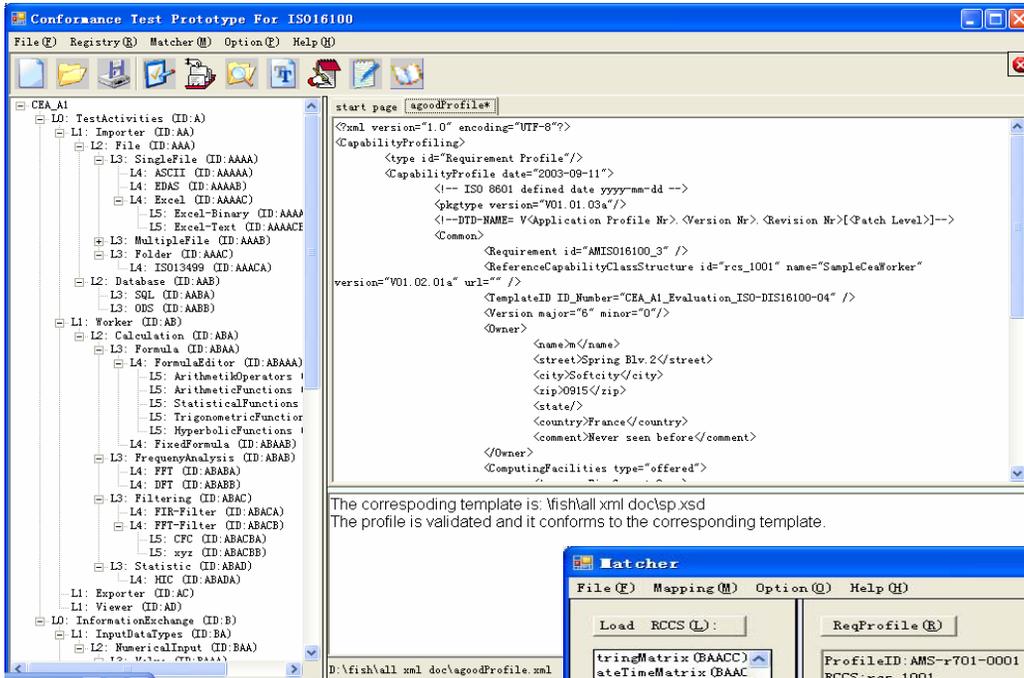
All Mandatory Match — all the mandatory functions in the required capability profile are completely matched with a corresponding set of manufacturing functions referenced in the MSU capability profile. The matching level report includes information about the details of the MSU functions in the corresponding set.

Some Mandatory Match — the required capability profile is matched partially by the MSU capability profile. The matching level report includes information about the details of the MSU functions that matched the functions referenced in the required capability profile.

No Mandatory Match — none of the mandatory functions referenced in the required capability profile match the functions referenced in the MSU capability profile.

Demonstration of Conformance Testing for ISO 16100

presented by
Prof. Qian Wang
(Southeast Univ., CHINA)

Main Interface

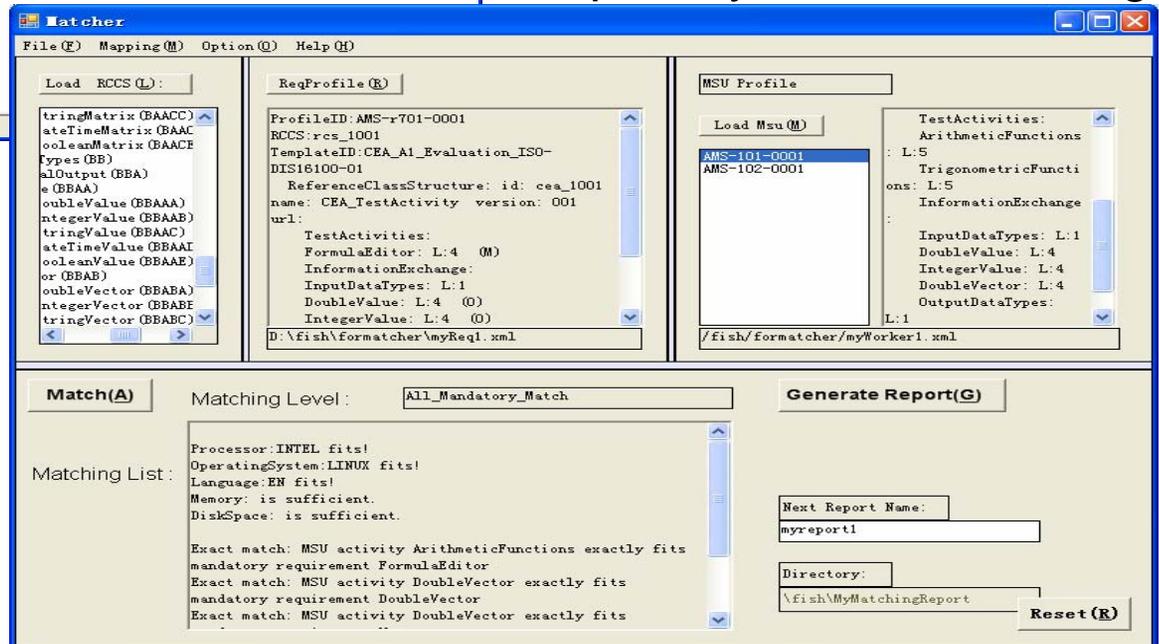Capability Profile Matching

Future plans for ISO 16100 Project

Intent of ISO 16100

- To provide methodologies and technologies together into solutions that dramatically reduce the time and cost associated with the development and integration of software capability and assurance.

- To manage interoperability and assurance of manufacturing software units through their profiles which describe their capabilities.

ISO/TC184/SC5/WG4 Meetings	16100-5 editor: Japan	16100-6 editor: China
2007-3-8/9 Rosslyn, USA	(undergoing DIS ballot)	initial discussion
2007-05-07/09 Los Angeles, USA	(undergoing DIS ballot)	Kick-off 16100-6 project
2007-10-01/03 London, England	Review and resolve DIS comments	Review of 1st WD
2008-01 Location TBD	Review and resolve DIS comments	Review of 2nd WD