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Manufacturing Domain Task Force Roadmap

Version 5.3

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1 Purpose and Audience

“Prediction is very difficult, especially about the future”

– variously attributed to Niels Bohr and Winston Churchill

The Manufacturing Domain Task Force Roadmap (“the Roadmap”) serves as a plan and schedule for activities conducted by the Object Management Group’s Manufacturing Domain Task Force (“MfgDTF”). It identifies categories of activity and specific work items within those categories. It also records the history of the MfgDTF. This is beneficial to two types of audience:

- To outsiders, for instance to suppliers who are examining Requests for Information (“RFIs”) or Requests for Proposals (“RFPs”) issued by the MfgDTF, the Roadmap provides the context necessary to understand where this effort came from. For more information about the OMG technology adoption process (RFIs, RFPs, etc.), see Section 4.1 and [OMG98]. It explains what past deliverables the new request is meant to complement. Finally, it lists what future efforts may be dependent on the current work.
- To members of the MfgDTF, the Roadmap serves as a record of past efforts and of the intended future efforts. This helps steer the group in a consistent direction, given that membership fluctuates over time, as well as attendance at successive meetings.

The Roadmap document itself includes the following sections and appendices:

- **Purpose and Background** – this section.
- **Subdomains and Working Groups** – a description of the organization of the MfgDTF.
- **Past and Current Work Items** – a description of work items completed to date or in progress, both in terms of their contents and timeline.
- **Future Work Items** – a forecast of the work of the MfgDTF, using the same dual format of an intended timeline and a description.
- **Liaison and Promotion Activities**
- **Revision History**
- **Glossary**
- **Bibliography**

The document is owned by the MfgDTF – changes to the document are approved by a vote of the entire Task Force. It is edited by co-editors, which the MfgDTF assigns from time to time for this purpose. The co-editors of the current version are Claude Baudoin (Schlumberger) and Evan Wallace (NIST).

A specific mailing list exists for the purpose of discussing the format and contents of the roadmap (note that substantial items of concern to the entire task force should be sent to the full mailing list, mfg@omg.org). The mailing list address is mfg_roadmap@omg.org, and requests to be added to the list should be sent to request@omg.org.

2 Overview of the Manufacturing Domain Task Force

The MfgDTF was formed at the San Diego, Calif., Technical Committee Plenary, January 12, 1996, as a successor to the Manufacturing Special Interest Group, which had been created at the Tokyo, Japan, Technical Committee Meeting, October 27, 1992.

The mission of the MfgDTF (OMG document mfg/1996-01-03) is to:

Foster the emergence of cost-effective, timely, commercially available and interoperable manufacturing domain software components through CORBA technology.

Like other OMG groups, the MfgDTF conducts its work by adopting specifications submitted by member organizations (which may be suppliers or users of manufacturing software) in response to RFPs. The priorities for the issuance of RFPs, hence for the standardization of technology, are derived from industry responses to RFIs, or from directions established in White Papers. As a result of this process, which is more completely explained in other OMG documents, the Roadmap largely consists of describing the succession of RFIs and RFPs issued or planned by the MfgDTF. The Roadmap also lists the working groups that are charged with the creation of these requests and the evaluation of the responses.

Because OMG specifications include models as well as interfaces, the collection of manufacturing specifications adopted by the OMG constitutes an expanding body of models of the manufacturing domains.

In addition to the specification work, the MfgDTF supports other OMG activities by ensuring consistency among relevant domain software components, and promotes its work by recruiting members and establishing liaisons with other relevant industry groups. During its meetings, it also hosts presentations by its members on software system interoperability issues that affect the manufacturing community.

The scope of the MfgDTF can be summarized as follows:

Top Areas of Interest of the Manufacturing Domain Task Force

Product Data Management (PDM) – interfaces to systems that aid in management (creation, organization, access control) of data associated with a product during (and after) its design, engineering and production.

Industrial Control – interfaces to systems and devices involved in the production of material goods in order to monitor and control production processes.

Computer Aided Design (CAD) – interfaces that allow access to product geometry and topology.

Computer Aided Engineering (CAE) – interfaces to engineering applications involved in design and analysis, in order to enable automated execution from other applications such as CAD systems.

Virtual Manufacturing Environment – interfaces and models to enable simulation of manufacturing to aid product design and engineering.

Production Information System – interfaces to systems such as Manufacturing Execution Systems, which manage manufacturing processes, information, and facilities.

Enterprise Resource Planning – ERP systems provide the transaction and database backbone for business and manufacturing operations from materials acquisition through product delivery, and support all the planning activities associated with them. The principal interest of the MfgDTF is in interfaces for the planning and management of materials, equipment, facilities, and people as they are used in production (as distinct from "business") activities.

Distributed Simulation Systems Facility – This facility allows simulations to interoperate to create a larger simulation or model. It furnishes mechanisms to exchange data, express selective interest in kinds of data, establish and transfer responsibility for modeling simulation entities, and coordinate the advance of logical time.

To address these areas, the MfgDTF is subdivided into six working groups (“WGs”):

Name	Scope	Chairs	Start	End
Enterprise Resource Planning (ERP) WG	Order management, production, materials planning, financial and related functions	Bruce Ambler (Lucent) and Ed Barkmeyer (NIST)	March 1997	
Manufacturing Execution Systems/Machine Control (MES/MC) WG	Distributed control systems, supervisory control and data acquisition, other controls designed to automate the manufacturing process	[Open] Note: the MES/MC WG has its own roadmap, posted on the MfgDTF web site.	June 1997	
Product & Process Engineering (PPE) WG	CAD, CAE, process modeling, and PDM	Larry L. Johnson (MSC Software) and Ilan Weitzer (Ford Motor Co.)	April 1998	
Common Business Objects (CBO) WG	Definition of common objects of interest to manufacturing, which may also be considered by other OMG groups	Ed Barkmeyer (NIST)	June 1997	
Manufacturing Simulation WG	Simulation applied to manufacturing processes	Fred Kuhl (MITRE)	?	
Testability WG	Improve the testability of MfgDTF standards through collaboration with RFP development teams, RTFs, FTFs and the Test SIG	David Flater (NIST)	Dec. 2000	

3 Description of the Roadmap

The Roadmap consists of a set of “work items” together with their schedule (actual or tentative) and the dependencies between them.

3.1 Types of Work Items

The main “work items,” in the sense of the Roadmap, can be a White Paper, a Request for Information (RFI), a Request for Proposals (RFP), or a Request for Comments (RFC). The complete definition of the OMG process to define and adopt these work items is contained in [OMG98] and is not reproduced here.

In the case of an **RFP**, several events are of importance and are tracked in the Roadmap:

- the start of the work to generate the RFP,
- the issuance of the RFP by the Domain Technical Committee,
- the adoption of the technology,
- the appearance of the first commercial implementation.

For an RFI, the time line is simpler since the RFI does not lead to the technology adoption process. The meaningful events are:

- the start of the work to generate the RFI,
- the issuance of the RFI by the Domain Technical Committee,
- the conclusion of the process of receiving and reviewing the responses.

For a White Paper, there are only two milestones:

- the start of the work to generate the White Paper,
- the issuance of the White Paper by the Domain Technical Committee or by the Task Force.

For an RFC, there are three meaningful milestones:

- the unsolicited submission of the RFC by a member company or group of member companies,
- the release of the RFC by the Domain Technology Committee (“DTC”) and the Architecture Board (“AB”) for public comments,
- the adoption or rejection of the RFC by the DTC and AB.

Adopted specifications may undergo subsequent revisions. Since this work consists of evolving the initial specification, the work of the Revision Task Force (**RTF**) will be shown in the roadmap as a continuation of the initial work item. The two meaningful milestones for the revision process are:

- the formation of the RTF,
- the adoption of the revised specification by the DTC.

Other work items of the MfgDTF can include a response to another OMG body's RFI, or a liaison activity with another industry consortium or standards organization. Liaison efforts are listed in a subsequent section.

3.2 Format of Work Item Description

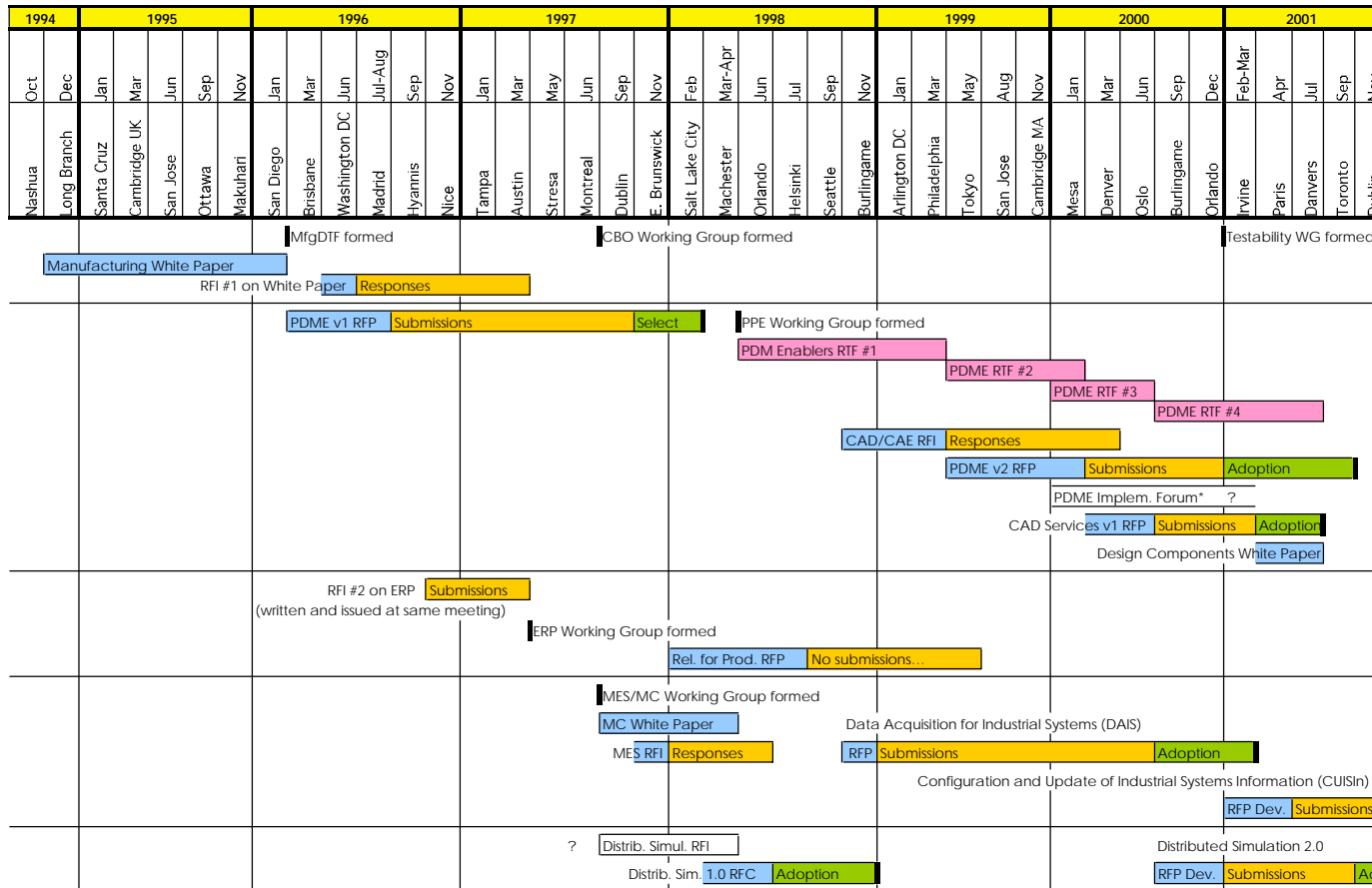
Past and current work items are described in two ways. The first one (Section 4.1) is a "time line" showing the milestones for each effort, and any significant dependencies between work items. The second description (Section 4.2) is a table mentioning important aspects of each effort: its purpose, status, references, and comments.

Future work items currently planned or considered by the MfgDTF are described in a similar manner with a time line in Section 4.3, and a descriptive table in Section 4.4. However, because these are future items, the timetable is only indicative. While these sections present the current state of the MfgDTF's intentions, the Task Force may at any point reorder its priorities, add, or cancel items.

Some items are repeated between the charts in Sections 4.1 and 4.3. These are the items that straddle the current date – work started in the past, is in progress now, but is not due to complete until some time in the future. By replicating these items between the two charts, both timelines show a fair representation of the workload of the MfgDTF and its working groups.

4 Tables and Figures

4.1 Timeline of Past and Current Work Items



Legend:

- Prepare (blue bar)
- Responses (yellow bar)
- Adoption (green bar)
- Revise (pink bar)
- ← Issuance of specification
- ← Initial submission deadline
- ← Issuance of RFI/RFP
- ← Start of work on this item

The date of each meeting corresponds to the right edge of the column in which it appears

* not an official OMG body

4.2 Description of the Past and Current Work Items

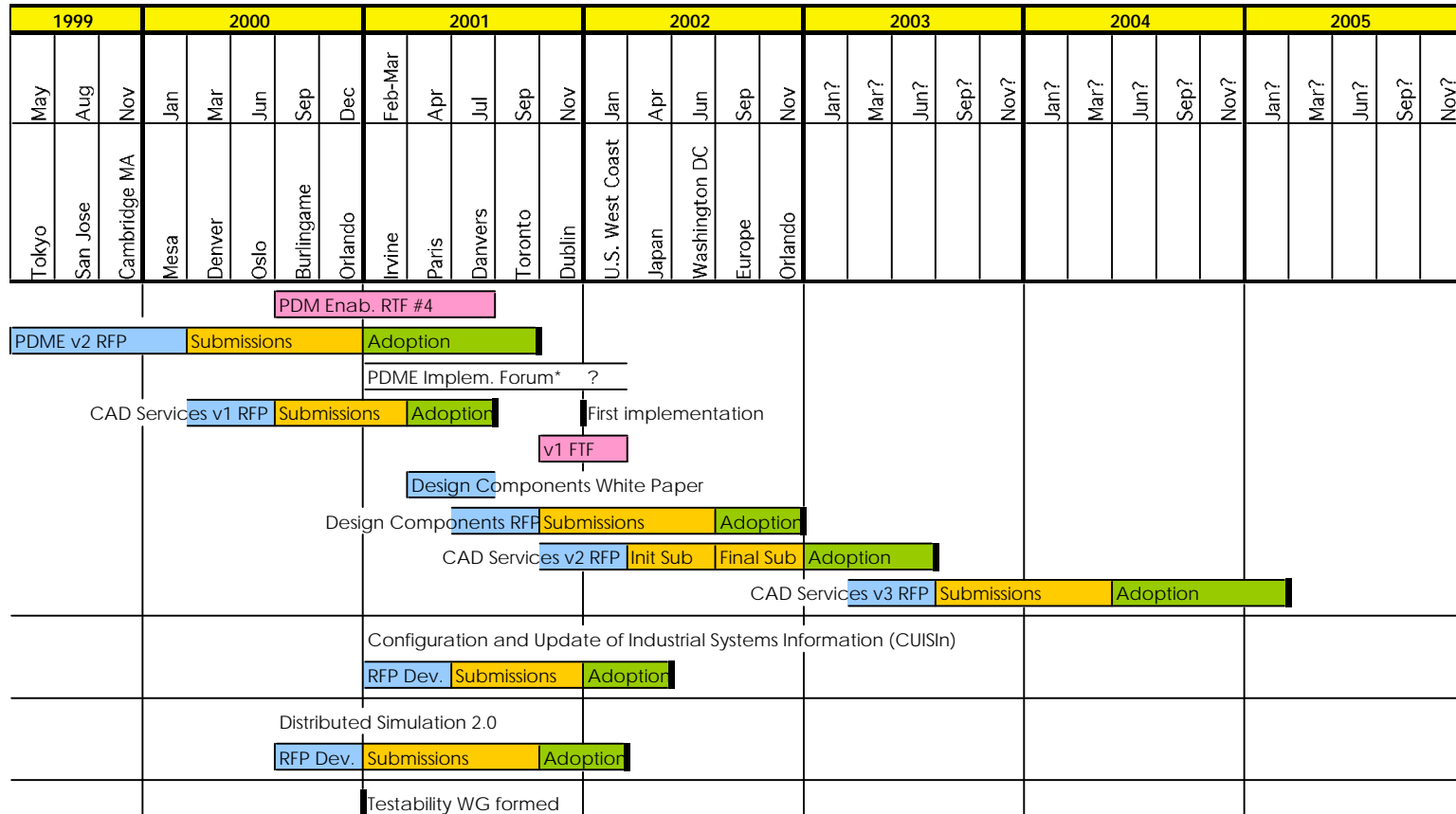
Name of Work Item	Purpose and Benefits	Status, References
White Paper: Manufacturing Enterprise Systems	Provide a high-level description of manufacturing systems. Preview special requirements for the benefit of the groups working on evolution of the Object Management Architecture. Identify areas where OMG specifications need to be extended to support Manufacturing.	Complete. [Mfg96a]
RFI #1: Comments on Manufacturing Enterprise Systems White Paper	Solicit validation of, and information on, the “High Level Requirements” chapter of the White Paper. Help identify a high-level partitioning of the proposed Manufacturing Object Model. Improve the list of infrastructure requirements. Solicit input on other relevant efforts to revise Appendix A. Derive requirements from the reference documents in Appendix B.	Complete. [Mfg96b]
RFI #2: Enterprise Resource Planning	Solicit input on whether the scope of ERP is such that more than one RFP should be issued (and, if so, solicit the list of smaller units that should be addressed by individual RFPs). Solicit input on what other systems should be integrated with ERP.	Complete. [Mfg96d]
RFP #1: Product Data Management Enablers 1.0	Specify “enablers” to assist PDM system developers in accomplishing eight defined business processes: Request for Engineering Action; Engineering Change Order; Manufacturing Implementation; Document Management for Product Definition; Product Structure Definition; Product Structure Effectivity; Configuration Management; and Test, Maintenance and Diagnostic Information.	Adopted. RFP: [Mfg96c] Submission: [Mfg98a]

Name of Work Item	Purpose and Benefits	Status, References
Response to BODTF RFI #1	The Business Objects Domain Task Force (BODTF) issued an RFI to define a reference architecture to understand and reconcile the dependencies between individual domains. Responding to the RFI was consistent with the mission of the MfgDTF, which works in areas (PDM, MES/MC, ERP) that share business objects. The response concentrated on interfaces to business components for use across an industry or across multiple industries.	Complete. RFI: [BOM97] Response: [Mfg97a]
PDM Enablers Revision 1.1	Address errors and omissions in IDL. Editorial corrections and technical clarification of the specification. Responses to questions and commentary on the submission from industry.	Chartered April 1998. Adopted March 1999.
PDM Enablers Revision 1.2	Address errors and omissions in IDL. Editorial corrections and technical clarification of the specification. Responses to questions and commentary on the specification from industry.	Chartered March 1999. Adopted February 2000.
PDM Enablers Revision 1.3	Address errors and omissions in IDL. Editorial corrections and technical clarification of the specification. Responses to questions and commentary on the specification from industry.	Chartered November 1999. DTC Plenary electronic vote begun June 2000.
PDM Enablers Revision 1.4	Address errors and omissions in IDL. Editorial corrections and technical clarification of the specification. Responses to questions and commentary on the specification from industry.	Chartered June 2000. Revision due March 5, 2001.
RFI #3: Manufacturing Execution Systems	Validate the definition of MES. Develop a decomposition or functional breakdown of the MES area to guide subsequent RFPs. The MESA International model significantly influenced this work.	Issued 8-Nov-1997. Evaluation completed in June 1998. [Mfg97b]

Name of Work Item	Purpose and Benefits	Status, References
White Paper: Machine Control	Provide background information on what is machine control with a manufacturing context, and its relationship with MES, ERP, P/PE and PDM.	[Mfg98b]
RFI #4: Distributed Simulation	Solicit requirements for simulation object interoperability, on behalf of the Simulation Domain Special Interest Group (SimSIG).	Issued in April 1998. [Mfg98f]
RFC #1: Facility for Distributed Simulation Systems	Provide a standard framework to facilitate interoperability between all types of models and simulations, both among themselves and with command and control systems. Facilitate the reuse of modeling and simulation components. The Defense Modeling and Simulation Office (DMSO), an agency of the U.S. Department of Defense, submitted this RFC.	Sponsored by MfgDTF on behalf of the Simulation SIG. Adopted as an OMG standard in 1998. [Mfg98e]
RFP #2: Release for Production	Establish interoperability standards to enable manufacturing facilities to plan and schedule a production order from the enterprise schedule.	Issued in June 1998 [Mfg98d]. No responses.
RFP #3: Data Acquisition for Industrial Systems (DAIS)	Provide interface definitions for (a) machine control data access, (b) event notification for availability of data, (c) event -driven data upload. These interfaces enable applications outside of the Machine Control environment (e.g., MES, CAD/CAM or ERP) to access data generated within the machine control environment.	RFP issued jointly with the Utilities DTF in January 1999. Adoption targeted for Feb 2001 [Mfg98g]
RFI #4 (duplicate number): Product & Process Engineering	Solicit information from industry to guide the Task Force in Establishing a Roadmap of Interface Specifications for Product & Process Engineering (PPE) functionality. Determine the Requirements for each of the PPE Specifications.	Issued in January 1999 [Mfg99a]

Name of Work Item	Purpose and Benefits	Status, References
RFP: PDM Enablers v2.0	Modify and extend the PDM Enablers to reduce the complexity of client code, allow server implementations to attain improved performance, and provide some additional functionality (e.g., Queries, Events, etc.).	Issued January 2000. [Mfg 00a] Adoption targeted for April 2001.
RFP: CAD Services v1	Interfaces that enable the interoperability of CAD, CAM and CAE tools.	Issued in June 2000, final submission planned for April 2001. [Mfg00b]

4.3 Timeline of Future Work Items



* not an official OMG body

Legend:

Prepare	Responses	Adoption	Revise
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<- Issuance of specification
 <- Initial submission deadline
 <- Issuance of RFI/RFP
 <- Start of work on this item

The date of each meeting corresponds to the right edge of the column in which it appears

4.4 Description of Future Work Items

In this table, the rightmost column, entitled “WG,” designates the Working Group intended to be in charge of the elaboration of each work item.

Name of Work Item	Purpose / Benefit	Target Audience	Dependencies	WG
Federated Product Data Management RFP	<p>Support interoperability between PDM services supplied by multiple vendor implementations. For instance, allow an assembly in one vendor’s PDM system to be composed of parts whose descriptions are in another PDM system.</p> <p>The PDM Enablers specification (incl. V2.0) provides for interoperability between a client and the underlying PDM server, but assumes that there is a single vendor supplying the PDM services and managing the PDM “space.” Federation removes this constraint.</p>	PDM Enablers respondents.	PDM Enablers V2.0.	PPE
CAD Services v1 Revision Task Force	This Task Force will look to expand various aspects of the graphical interfaces in version 1 by providing some limited presentation services.	CAD Services V1.0 respondents.	CAD Services V1.0.	PPE

Name of Work Item	Purpose / Benefit	Target Audience	Dependencies	WG
RFP: CAD Services v2	The CAD Services team plans tasks to encompass some elements of Knowledge Based Engineering (KBE). This includes geometry creation through features-based creation, constraints and rules. It also includes construction history capture and definition.	CAD Services V1.0 respondents, and other CAD vendors.	CAD Services V1.0.	PPE
RFP: CAD Services v3	CAD Services v3 shall address issues of full integration with the manufacturing process, including full PDM integration allowing complete support for PDM product structure and workflow.	CAD Services V2.0 respondents, and other CAD, PDM and MRP vendors.	CAD Services V2.0.	PPE
Manufacturing Object Model	Define a reference model for manufacturing domain software components. This assists the MfgDTF in its activities and identifies how the MfgDTF model relates to other OMG models.	MfgDTF, BODTF, other groups requiring a reference model of manufacturing software components.	Development of the model would be done on the basis of technical material included in responses to RFPs.	n/a
Distributed Simulation System Facility V2.0	Remove ambiguities in version 1.1. Simplify the use of the Data Distribution Management Services.	Adopters of the initial specification.	IEEE P1516 (derived from the U.S. DoD M&S HLA)	SIM
Common Business Object "Green Paper"	Identify those objects that are expected to be of concern to either multiple working groups within the MfgDTF, or to some part of the MfgDTF and to other OMG groups, such as the Finance DTF or CORBAmed.	The members of the concerned DTFs and groups working on these common objects, and the Business Objects DTF.	The green paper can only take into account objects identified by multiple parties at the time it is written. More common objects will appear later.	CBO

Name of Work Item	Purpose / Benefit	Target Audience	Dependencies	WG
Manufacturing Resource Management and Product Instance Tracking RFP	Address the management of materials, labor, and equipment resources. The benefits include reduced time to market, improved productivity, enhanced quality, and reduced costs.	Developers of Manufacturing Execution Systems (MES) and of systems that interact with MES.		MES
Multiple RFPs on Manufacturing Execution Systems	<p>The MfgDTF has identified these topics as candidates for potential RFPs related to ME S:</p> <ul style="list-style-type: none"> • Operations/Detail Scheduling • Dispatching Production Units • Material Storage and Transport • Maintenance • Process Management • Quality Management • Performance Analysis • Health, Safety and Environment Management • Data Collection • Document Control 			MES
RFC: IDL Bindings to the Standard Data Access Interface (SDAI)	<p>ISO has adopted an international standard that binds IDL to SDAI (ISO10303-26). SDAI defines operations to manipulate product data defined through schemas created using EXPRESS, and facilitates the integration of different software components.</p> <p><why is this important? who wants this?></p>			
UML Profile for EXPRESS	<see Bernd>			PPE

Name of Work Item	Purpose / Benefit	Target Audience	Dependencies	WG
Workflow Management Object Model Revision	In order to support notions of a schedule, it will probably necessary to enhance the Workflow Management Object Model. This could be a manufacturing-specific specialization, under the auspices of the MES/MC working group.			MES
White Paper on Relationship with STEP	Concerns have been expressed by a number of groups, outside and inside of OMG, that the work of the Manufacturing DTF in the PPE area (PDM Enablers, CAD Services) overlaps with the ISO STEP standards. A white paper clarifying the relationship, and positioning the work of the Manufacturing DTF as something that leverages the STEP standards, rather than competing with them, would help resolve these concerns.			PPE
Configuration and Update of Industrial Systems Information (CUISIn) RFP	Expand the object domain, add notification subscription, add the ability to create and update information, include multiple views of data and relationships	Same as DAIS	Adoption of DAIS	MES
Visualization RFP	Define a common CAD Viewer API, which is able to work on top of CAD Services interfaces.	CAD Services V2.0 respondents, and other CAD, PDM and MRP vendors. 3D visualization vendors.	CAD Services V 1.0	PPE
Design Components "White Paper"	Provide background information on the idea of Design Components as the specification of composition of CAx system from well-defined components that encapsulate computational (algorithmic) aspect.	The members of Manufacturing DTF, CAx vendors, industrial users, research laboratories, universities.		PPE

Name of Work Item	Purpose / Benefit	Target Audience	Dependencies	WG
Design Components RFP	Proposes the composition of CAx system from well-defined components that encapsulate computational (algorithmic) aspect, dedicated to different areas of CAx (mechanical, optical, electrical, etc.).	CAD Services V2.0 respondents, industrial users, CAx vendors and universities.	CAD Services V 1.0 Design Components “White Paper”	PPE

4.5 Liaison and Promotion Activities

Organization	Purpose and Benefits	Status and References
ISO TC 184 SC 4	<p>The scope of ISO Technical Committee 184 (Industrial Automation Systems and Integration), SubCommittee 4 (Industrial Data) is to standardize information shared or exchanged in the area of industrial and manufacturing applications:</p> <ul style="list-style-type: none"> • Product Data • Industrial Manufacturing Management Data • Global Manufacturing Programming Languages 	<p>Active. Contacts: Peter Denno and Evan Wallace (NIST)</p>
Open Applications Group (OAG)	<p>OAG is a non-profit consortium formed to create common standards for the integration of enterprise business applications. OAG specifications are complementary to interoperability work currently underway by organizations such as OMG and Open Group.</p>	<p>Active. Contact: Bruce Ambler</p>

Organization	Purpose and Benefits	Status and References
Semiconductor Equipment Manufacturers International (SEMI)	<p>Semiconductor Equipment and Materials International (SEMI) is an international trade association of suppliers of equipment and materials to the semiconductor industry. SEMI produces specifications and standards for their industry. The benefits of a SEMI liaison to the MfgDTF include:</p> <ul style="list-style-type: none"> • Broadening the work of the MfgDTF beyond discrete manufacturing • Access to experts from a key segment of manufacturing. 	<p>Established April 1998. Contact: Bob Hodges</p>
Advanced Configuration Management Systems (ADCOMS)		<p>Considered but not established.</p>
Association for Information and Image Management (AIIM)		<p>Considered but not established.</p>
Advanced Information Technology (AIT)	<p><Ilan to follow up></p>	<p>Pending</p>
Automotive Industry Action Group (AIAG)	<p><Ilan to follow up></p>	
Promotion: OMG Manufacturing Executives Day	<p>Promote the activities of OMG and the MfgDTF to the industry (suppliers as well as customers).</p>	<p>Held in conjunction with the August 1999 OMG meeting.</p>

5 Revision History

v5.3	18-Jun-01	Added Visualization RFP and Design Components information supplied by Mikhail Kazakov, and PDME schedule information provided by Larry Johnson.
v5.2	27-Feb-01	Changed CAD Services RTF to an FTF. Replaced DCIS with CUI-SIn RFP.
v5.1	18-Feb-01	Updates submitted by DTF members in December 2000: DCIS, Testability WG, CAD Services roadmap. Split the chart into two (past/current and future). Fixed the incorrect section references in Section 3.
v5.0	14-Sep-00	Complete (simplified) rewrite of the roadmap based on guidelines established at the January 2000 meeting. Edited by Claude Baudoin and Evan Wallace, roadmap co-editors. Adopted at the Burlingame meeting.
v4.0	16-Sep-99	OMG Document mfg/99-09-15. Incorporated changes discussed at the January 1999 MfgDTF meeting (Neil Christopher, NIST, editor). Further changes made by Larry Johnson, temporary roadmap editor, reflecting decisions of the MfgDTF plenary meeting held in San Jose, August 1999.
v3.1	30-Jun-98	Incorporated activity defined at the June 1998 MfgDTF meeting; documented number changes, date changes, and results of the MES RFI evaluation.
v3.0	13-Apr-98	1998 overhaul and updates (mfg/98-03-08), plus changes based on review comments received at the April 1998 MfgDTF meeting (mfg/98-04/06).
v2.0	25-Sep-96	Major additions as agreed upon at September 1996 meeting (mfg/96-09-03).
v1.0	01-Jul-96	Incorporated activities defined at the June 1996 MfgDTF meeting, as well as comments on the initial draft of this version (mfg/96-06-03).
Draft C	1996	Expanded definition of RFP #1. Added activity.
Draft B	1996	Text added to paragraph outlines. Added references to RFP #1 and RFI #1.
Draft A	Mar-96	First draft (outline only). Reviewed at March 1996 meeting.

Appendix A: Glossary of Acronyms and Abbreviations

AB	(OMG) Architecture Board
API	Application Programming Interface
APS	Advanced Planning Systems
BoD	(OMG) Board of Directors
BODTF	(OMG) Business Object Domain Task Force
CAD	Computer Aided Design
CAE	Computer-aided Engineering
CAM	Computer Aided Manufacturing
CBO	Common Business Objects
CIM	Computer Integrated Manufacturing
CORBA	Common Object Request Broker Architecture
CUISINE	Configuration and Update of Industrial Systems INformation
DAIS	Data Acquisition for Industrial Systems
DCM	(OMG) Domain Contributing Member
DCS	Distributed Control Systems
DMSO	(U.S. Government) Defense Modeling and Simulation Office (http://www.dmsomil/)
DNC	Distributed Numerical Control
DoD	(U.S. Government) Department of Defense
DTC	(OMG) Domain Technical Committee
DTF	(OMG) Domain Task Force
EC	Engineering Change
ECO	Engineering Change Order
ERP	Enterprise Resource Planning
HLA	High Level Architecture
IDL	(OMG) Interface Definition Language
ISO	International Organization for Standardization (http://www.iso.ch/)
KBE	Knowledge-based Engineering
LOI	Letter of Intent

MC	Machine Control
MES	Manufacturing Execution Systems
MfgDTF	(OMG) Manufacturing Domain Task Force (http://www.omg.org/mfg)
MRP	Material Resource Planning
OAG	Open Applications Group (http://www.openapplications.org)
OMG	Object Management Group (http://www.omg.org)
PDA	Product Design Automation
PDM	Product Data Management
PLC	Programmable Logic Controller
PTC	(OMG) Platform Technical Committee
P/PE	Product / Process Engineering
RFC	Request for Comments
RFI	Request for Information
RFP	Request for Proposal
RTF	(OMG) Revision Task Force
RTI	Runtime Infrastructure
SCADA	Supervisory Control and Data Acquisition (systems)
SCM	Supply Chain Management
SDAI	Standard Data Access Interface
SEMI	Semiconductor Equipment and Materials International (http://www.semi.org)
SIG	(OMG) Special Interest Group
SSM	Sales and Service Management
STEP	Standard for Exchange of Product Model Data [ISO94b]
TC	(OMG) Technical Committee
TQM	Total Quality Management

Appendix B: References

Documents issued by the OMG are stored electronically at the OMG site. Each document has an OMG number of the form group/yy-mm-nn, where group is a subgroup of the OMG ("mfg" for Manufacturing), yy & mm are the year and month issued, and nn is a serially assigned number (starting with "01" for each month). Specific documents can be accessed by document number using the URL form:

<http://www.omg.org/cgi-bin/doc?group/yy-mm-nn>

This URL will return a list of all formats of the document available. Customarily, documents are supplied in Microsoft Word (.doc), Rich Text Format (.rtf), Postscript (.ps), and Adobe Portable Document Format (.pdf). Occasionally, formats such as Microsoft Powerpoint (.ppt), FrameMaker, Zip and others will be encountered. Portable Document Format (.pdf) files requires the freely available [Acrobat](#) reader.

MfgDTF documents can also be obtained via FTP by appending the document number and the relevant file extension to "ftp://ftp.omg.org/pub/docs/mfg". For example, the PostScript version of the MfgDTF white paper can be obtained from:

<ftp://ftp.omg.org/pub/docs/mfg/96-01-02.ps>

All documents listed below with a reference of the form [Mfgxxx] or [OMGxxx] are published by the Object Management Group, Framingham, Mass., or Needham, Mass. The year of publication is the year included in the document reference. These references have been simplified accordingly.

- [AMR93] "Manufacturing Software Survey," *Managing Automation, Advanced Manufacturing Research*, June 1993, p.34.
- [CW93] "Standards Sought for Controls, Information System Link," *Chemical Week*, November 24, 1993.
- [BOM97] Object Management Group: *Business Object Domain Task Force RFI-1*. Document bom/97-06-02. Framingham, MA: Object Management Group, 1997.
- [ISO94a] International Organization for Standardization. ISO 10301-11:1994.
- [ISO94b] International Organization for Standardization: *Product Data Representation and Exchange*. ISO 10303: 1994.
- [ISO96] International Organization for Standardization. "*Interface Definition Language (IDL) Binding to the Standard Data Access Interface (SDAI) Specific action*." ISO 10303-26. 1996.
- [MESA97] *MES Explained: A High Level Vision*. White Paper 6 by MESA International. September, 1997.

- [Mfg96a] *Manufacturing Enterprise Systems, Version 1.0* (Claude Baudoin, editor). Document mfg/96-01-02.
- [Mfg96b] *Manufacturing Domain Task Force RFI-1*. Document mfg/96-05-02.
- [Mfg96c] *Manufacturing Domain Task Force RFP-1: Product Data Management Enablers*. Document mfg/96-08-01.
- [Mfg96d] *Manufacturing Domain Task Force RFI-2: Enterprise Resource Planning*. Document mfg/96-09-02.
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- [Mfg97b] *Manufacturing Domain Task Force RFI-3: Manufacturing Execution Systems (MES)*. Document mfg/97-11-01.
- [Mfg98a] *PDM Enablers: Revised Submission (including errata)*. Document mfg/98-02-02.
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- [Mfg98g] *Manufacturing Domain Task Force RFP-3: Data Access from Machine Control*. Document mfg/98-06-14, and:
http://www.omg.org/techprocess/meetings/schedule/Data_Acquisition_RFP.html
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- [Mfg00b] *Manufacturing Domain Task Force RFP: CAD Services 1.0*. Document mfg/2000-06-02.
- [OMG97] *Object Management Architecture Guide, V3.0*. Document ab/97-05-05.

¹ The Task Force issued by mistake two Requests for Information numbered 4.

[OMG98] *Policy and Procedures of the OMG Technical Process, Version 1.5.* Document pp/98-03-03.