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## DMTF Standards and Terminology

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This technical note provides an overview of the Distributed Management Task Force (DMTF) standards and terminology. It is intended to provide a high level overview of the standards that are released by the DMTF, and the concepts and terms associated with these standards. This technical note is intended to be the starting point for anyone who is not familiar with the DMTF.

### Introduction

Management standards are critical to debug and correct customer problems that span business and vendor boundaries. Standards enable vendors to collaborate to provide integrated, consistent information, processes and operations. An open framework of common protocols and data (via a common information model) enable interoperability of managed entities across vendor boundaries. An immediate customer

benefit of management standards is the reduced operational costs from a simplified information technology (IT) infrastructure.

This technical note focuses on two primary areas. First, it explains the acronyms and terminology used across the DMTF to describe its standards. Second, the focuses of the various DMTF standards, and their relationships, are presented, describing how each standard fits with the others and provides a component of a comprehensive solution for global management.

### Terminology

This section contains terminology that someone who is new to the DMTF would find useful to understand the individual management standards.

#### ***Basic Input/Output System***

The Basic Input/Output System (BIOS) is the program that provides initial configuration settings when a personal computer is started. It is typically stored on an erasable programmable read-only memory chip that is part of the computer. The BIOS participates in loading the operating system software.

#### ***CIM Server and Object Manager***

The CIM Server receives and processes CIM Operation message requests, and issues responses to these requests. It is typically composed of CIM-XML protocol adapters, indication/event handlers, an object manager and [providers](#) of instrumentation data. The CIM Object Manager is a basic component of the CIM Server, responsible for the communication between the components of the Server.

#### ***Data Model***

A data model is a concrete representation of an [information model](#) in terms that are appropriate to a

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specific data store and access technology.

### **Distributed Management Task Force**

The Distributed Management Task Force (DMTF) is the industry organization that is leading the development, adoption and unification of management standards and initiatives for desktop, enterprise and Internet environments. Working with key technology vendors and affiliated standards groups, the DMTF is driving the [CIM](#) (Common Information Model), [WBEM](#) (Web-Based Enterprise Management), [DEN](#) (Directory Enabled Networking), [SMBIOS](#) (System Management BIOS), [ASF](#) (Alert Standard Format) and [DMI](#) (Desktop Management Initiative) standards.

### **DMI Service Provider**

A [DMI](#) Service Provider coordinates communication from management applications to the specified component instrumentations. Within the CIM architecture, the CIM Object Manager performs a similar function.

### **Information Model**

An information model is an abstraction and representation of the entities in a managed environment – their properties, operations and relationships. It is independent of any specific repository, application, protocol or platform.

### **Managed Object Format**

CIM management information is described in a language based on the Open Management Group's (OMG's) Interface Definition Language (IDL). CIM's language is called Managed Object Format (MOF). The MOF syntax is a way to describe object/class definitions in textual form. It establishes the syntax for writing management entity definitions.

The main components of a MOF specification are the textual descriptions of meta-data information (qualifiers), classes, associations, properties, references, and methods, as well as instance declarations. A MOF specification can be processed using a compiler (such as is included in various open-source WBEM implementations, [www.wbemsource.org](http://www.wbemsource.org)). A MOF file can be encoded using either Unicode or UTF-8.

### **Management Client / Application**

A management client is a program that initiates management requests. The management client interacts with a management infrastructure or agent (via a protocol and data model) to perform management operations.

### **Operating System-Absent**

Operating System-Absent is a term used to describe the state of a computer when its operating system is not fully operational. Examples of OS-absent states include when the system is booting or hibernating, or when the boot has failed.

### **Operating System-Present**

Operating System-Present is a term used to describe the state of a computer when its operating system is fully operational. This is the typical operating system state when it is performing requests for users.

### **Provider / Instrumentation**

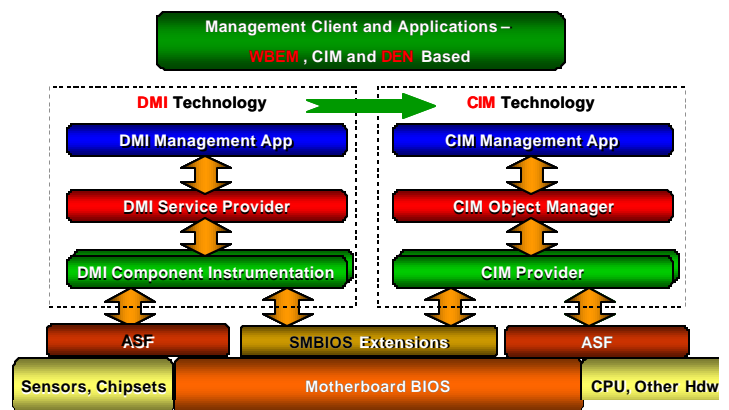
A provider reports on and/or dynamically interacts with the "real world", as requested by management clients. It instruments one or more aspects of the CIM Schema, performing the requested CIM Operations.

### **Unified Modeling Language (UML)**

The Unified Modeling Language (<http://www.omg.org/uml/>) is a graphical representation (using boxes and lines) of objects and relationships. The Object Management Group (OMG) publishes the UML Specification.

## **DMTF Standards**

This section describes the standards that are provided by the DMTF and explains how they are related and can be used together.



The figure above shows how the low level management interfaces such as ASF and SMBIOS interact with DMI and CIM-based technology to enable management operations. The DMTF's strategy is to migrate the DMI-based technology to the WBEM and CIM-based technologies to enable a single,

consistent management infrastructure. Additional information on each of the standards shown in the figure is provided in the remainder of this section.

### **Common Information Model**

The Common Information Model (CIM) is a conceptual model for describing a business' computing and networking environments - the managed entities, their states, operations, composition, configuration, and relationships. Model contents are not bound to a particular problem domain or implementation, but address end-to-end management from clients, to servers, and through the network.

CIM addresses both FCAPS management (fault, configuration, accounting, performance and security management) and supports the abstraction and decomposition of services and functionality. The information model defines and organizes common and consistent semantics for the managed entities. CIM's organization is based on an object-oriented paradigm – promoting the use of inheritance, relationships, abstraction, and encapsulation to improve the quality and consistency of management data.

### **Web-Based Enterprise Management**

Web-Based Enterprise Management (WBEM) is an initiative coupling CIM and Internet standard protocols and encodings (such as XML and HTTP). The WBEM architecture includes a CIM Server and various "providers" of management data (i.e., instrumentation). The CIM Server acts as an information broker between the providers of instrumentation data and management clients/applications. This design approach shields the providers from the various management clients and applications, and vice versa - allowing both groups to focus on providing competitive management features and functionalities.

The DMTF has developed a core set of standards that make up WBEM. These add an encoding specification (the xmlCIM Encoding Specification) and a transport mechanism (CIM Operations over HTTP) to the Common Information Model. The xmlCIM Encoding Specification defines XML elements (described in a Document Type Definition, DTD) representing CIM classes and instances. The CIM Operations over HTTP Specification defines how the CIM classes and instances are created, deleted, enumerated, modified and queried. Also, the specification defines a notification/alerting mechanism for CIM data.

### **Directory Enabled Networks**

Several years ago, the Directory Enabled Networks (DEN)

Consortium released DEN as an individual, independent specification. DEN defined an information model based on and extending CIM. Today, that specification and the DEN concepts have been incorporated into CIM and the ongoing DMTF work. There is now a single information model and DEN initiative.

The DEN initiative has evolved to describe how to use CIM and a directory to locate management information, and to access management data. DEN also specifies the low-level LDAP mappings for the DMTF's CIM releases. It provides a template for exchanging information across directories, and enables vendors to share a common (but extensible) definition of such entities as systems, applications, and services.

DEN is focused on communicating the benefits, usage and structure of a directory as a component in a complete management environment. Concepts are mapped from the CIM Schema to a directory, and this information is integrated with other elements of the management infrastructure. This work utilizes existing user and enterprise-wide data already present in a company's directory, empowers end-to-end services, and supports distributed network-wide service creation, provisioning, and management operations.

The use of CIM in defining a directory schema ensures that a consistent schema and a common understanding of directory information will be used across vendor implementations. Common schema and semantics are especially important when defining and decomposing platform-neutral, high-level policies. Integration within the WBEM infrastructure ties high-level, static directory contents to the more dynamic, real-time components of the management infrastructure.

### **Desktop Management Interface**

The Desktop Management Interface (DMI) Specification established a standard framework for managing networked desktop systems and servers. The initial DMI specification, which first released in 1993, enabled remote management through a well-defined interface and imposed a model for filtering events.

Version 2.0 of the Desktop Management Interface (DMI) Specification was released by the DMTF in April 1996. It extended the original specification by defining a mechanism to send DMI management information across the network, to non-local clients or a central site.

The DMI architecture includes a Service Layer, a Management Information Format (MIF) database, a Management Interface (MI), and a Component Interface (CI). The DMI Service Layer acts as an information broker between manageable products and management applications. The MIF database defines the standard manageable attributes of PC and server products.

The MI allows DMI-enabled management applications to monitor, manage and control desktop computers, their components and peripherals, while the CI allows components to be seen and managed by applications that call the DMI Service Layer. The CI gets real-time dynamic instrumentation information from manageable products and passes it to the MI via the Service Layer. This design approach shields component vendors from the various management clients and applications, allowing both groups to focus on providing competitive management features and functionalities.

### ***Alert Standard Format***

The Alert Standard Format (ASF) was designed to fill the gap of OS-absent systems management. The problem of systems manageability without an operating system has historically been solved with proprietary and relatively expensive solutions. ASF defines remote control and alerting interfaces for computers.

ASF consists of a client or server system (or several systems) and a management console that both monitors and controls the client. An ASF-aware computer provides the following interfaces to allow its remote management in an OS-absent scenario:

1. Transmission of messages by the ASF system including system health and security alerts
2. Receipt and processing of remote maintenance requests, sent by the management console
3. Ability to describe the client system's specific capabilities and characteristics to the management console
4. Ability to describe the software used to configure or control the client system in an OS-present state

### ***System Management BIOS***

The System Management BIOS (SMBIOS) Specification addresses how motherboard and system vendors present management information about their products, in a standard format. The Specification extends the BIOS interface on Intel architecture systems, enabling generic instrumentation to deliver this information to management clients and applications. SMBIOS eliminates the need for error prone operations like probing system hardware for presence detection.

As part of the integration of the DMTF standards, it is very desirable to display the SMBIOS data via DMI or CIM. To support this, sections of the SMBIOS Specification describe the translation from SMBIOS to corresponding DMI groups and CIM classes.

## **Closing Remarks**

The standards released by the DMTF benefit customers by reducing the cost of managing a business' computing and networking environments, and providing integrated cross-vendor management solutions. This technical note contains an overview of the DMTF standards, and where they fit in a comprehensive, global management infrastructure. More detailed technical information on these standards can be found in the standards area ([www.dmtf.org/standards/index.php](http://www.dmtf.org/standards/index.php)) of the DMTF web site.