DISTRIBUTED MANAGEMENT TASK FORCE

Technical Note

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# The Common Information Model

*CIM Version 2.7*

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This technical note introduces the reader to the Distributed Management Task Force (DMTF) Common Information Model (CIM). This note describes the benefits of CIM and explains how to position CIM within a corporate management infrastructure.

## Introduction

The Common Information Model was first released by the DMTF in April 1997 to standardize information about an organization's technology assets. CIM evolved from earlier efforts in the DMTF that were focused on desktop management, into a comprehensive end-to-end model for distributed hardware and software management.

ENTERPRISE MANAGEMENT MODEL



A consistent information model is a required, basic building block for successful integration and use of management data both within an organization's enterprise and between management vendors. CIM provides this information model for the enterprise and Internet management domains. Through CIM, more advanced customer solutions for inventory tracking, root cause diagnostics, and cross-vendor administration can be cooperatively developed.

Over the past few years, the DMTF has formed numerous alliances with other standards organizations and academic institutions to solidify its position in the industry as the leader in distributed management modeling. These alliances have been mutually beneficial to the DMTF and its alliance partners. They help the DMTF to validate existing models and to drive the priorities of future efforts. They give alliance partners a strong, consistent foundation of management modeling and infrastructure on which to build, to solve industry specific problems.

## The Common Information Model

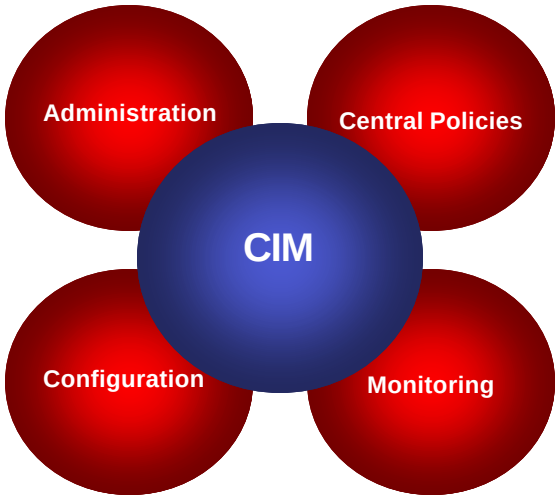
CIM is a conceptual information model for describing managed entities, their composition, and relationships. Model contents are not bound to a particular problem domain or implementation, but address end-to-end management. CIM consistently describes the contents and semantics of manageable entities across an enterprise in an Internet-friendly way. This allows operations to be defined to exchange management information and invoke actions by applications and management clients.

The management models are comprised of a Core Model and a set of Common Models that extend from the Core. Common models have been defined for systems, services, networks, applications, users, and databases; all the major technology domains that require management, from the network and operating system through applications. Information models have also been developed to specify

consistent, cross-vendor management policies, security, event management, support, and management infrastructure.

The models were designed to distinguish between the physical and logical aspects of the managed entities. The Physical Model describes how components that can be seen or touched, such as racks, chassis and cards, are physically configured. The logical aspects of CIM describe the higher-level, more abstract, functional elements, such as computer systems, databases, services and access points. Functional or behavioral concepts that are common across managed entities, such as capabilities, settings, statistics, resources, operational status, or enabled state are also defined in the Logical Model. They ensure that the semantics of concepts that span technical domains are consistently defined.

The strength of CIM includes the richness of the information models and its object-oriented representation, which allows integrators to extend from existing classes to include vendor specific content.




CIM models support all the basic requirements for managing an enterprise or service provider environment.

## The Benefits of CIM

There are several benefits from adopting CIM that are worth describing in more detail. For the purpose of this discussion, we will focus on several of the primary benefits from the integrators perspective.

CIM is defined using a language called Managed Object Format (MOF). MOF is a textual format (both human and machine-readable) for describing an information model using an object-oriented design. CIM can also be rendered using the Unified Modeling Language (UML) that is defined by the Object Management Group (OMG). MOF is formally defined in the CIM Specification. It includes a Meta Schema definition that defines the valid terms that are used to express a CIM schema and its usage. MOF is used to express the classes, associations, aggregations, properties, and methods that are part of the management domain. It allows integrators to express the exact semantics and behavior of their managed entities with the context of CIM.

***CIM is extensible.***

Integrators can extend from common classes to include any vendor value-added content or behaviors. This provides consistency at the higher levels of the model without giving up any vendor specific value added content. Model extensions automatically inherit higher-level schema content. This is a huge timesaver (versus starting each management model and solution from scratch) and promotes cross-vendor interoperability.

***CIM schemas can be partitioned.***

Integrators don't need to implement the complete CIM schema, just the portions that apply for their specific management requirements. By using or extending from existing CIM classes, it helps to ensure that semantics are maintained across integrators.

***CIM is protocol agnostic.***

The operations that are defined for CIM are independent of the protocol used. Currently, CIM supports an XML-based protocol called WBEM for encoding CIM operations. In the future, other protocols will be defined.

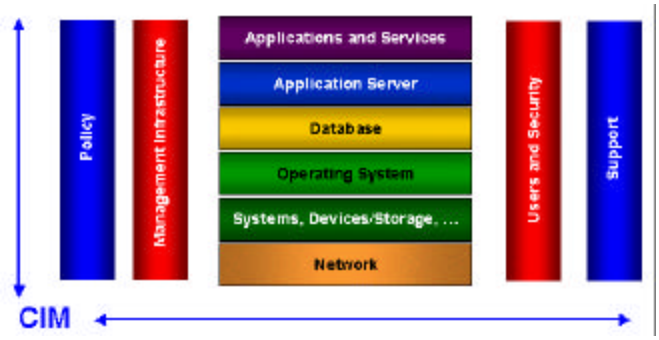
CIM helps integrators to discuss the entities that are important for management and how they relate to each other. It brings integrators together into a common understanding of the overall management environment across the enterprise or Internet. This level of detail makes it easier to share information between integrators in a cohesive solution.

***CIM is mapped to existing standards***

The information that is defined in CIM is mapped to existing standards such as SNMP, DMI, and ITU. This allows integrators who are familiar with the content as defined by these existing standard to more easily translate the management content to CIM.

## CIM Positioning

The CIM Core and Common Models cover a broad set of management content from low-level devices through applications, policies, and support.




Each model defines the relevant entities that require management for a technology area and how they are related to other entities within the overall CIM Schema.

As new systems and services are designed and incorporated into a managed environment, discussing the management requirements in the context of CIM makes it easier for an organization to specify the components and relationships of the new elements in a precise and consistent manner. Designers can reference CIM schemas to validate that new systems are complete. Comparing the model for a new system under development to the classes and relationships in CIM makes it easier to identify missing relationships and classes early in the design process. This avoids costly changes when management features are added to the system or service later in the implementation process.

When multiple vendors or products collaborate on a new system, less time and effort is required to integrate their individual components when they are based on CIM. The individual components will already be using consistent semantics.

A common misperception is that an organization must adopt the CIM-XML protocol in order to benefit from CIM. This isn't the case. Let's consider the scenario where an organization would like to integrate a legacy system with a new application module. Mapping both systems to CIM before the design specification for the integration is started will help to scope the integration effort and provide a common foundation for discussing integration possibilities.

## Current Status and Directions

The DMTF has recently announced the availability of the CIM compliance program. The initial release of the compliance program is a necessary first step towards adding direct end user value through CIM. It helps management vendors to confirm that their CIM extensions are valid. The next phase of the compliance program will verify that clients can access CIM content in a consistent way. Ultimately, the compliance program will help management users to identify cross-vendor technology that can be integrated into out-of-box management solutions. This will require vendors to provide consistent content in their implementations of CIM. This will give management users the ability to manage their enterprise using a variety of products and vendors and have out of the box manageability without excessive integration, translation, or mediation costs. Management users will have the flexibility to plug and play vendor offerings without needing to retrain administrators on new management interfaces.

Work is also underway within the DMTF to separate the CIM operations specification from the XML representation. This work is important to distinguish between the operations that are defined in CIM from the protocols that implement the operations. Currently, an XML-based protocol over HTTP has been defined. Additional protocols, such as a CIM-SOAP protocol, have been discussed and are in the planning stages. The management protocol technical committee in OASIS is developing an open industry standard protocol that will consolidate the work being done by the DMTF with other web-based industry accepted management protocols. Once this effort has been completed, management customers will have more flexibility for choosing the way that CIM-enabled clients access management content.

## Closing Remarks

CIM provides a consistent model for management that can be leveraged by technology vendors to provide more comprehensive, industry wide management solutions. Technology customers will benefit from this work by having more flexibility in choosing technology from CIM compliant vendors, reduced management training costs, and lower total cost of ownership. Additional work is needed to more rigorously define the schema content that is required at each level of the technology stack and to enforce it through the CIM compliance program.