CHAPTER 1

Introduction to Cisco DCNM for SAN SMI-S

Cisco Data Center Network Manager (DCNM) provides an industry standard application programming interface (API) using the Storage Management Initiative Specification (SMI-S). The SMI-S facilitates managing storage area networks (SANs) in a multivendor environment.

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About the Common Information Model

The Common Information Model (CIM) is an object-oriented information model that describes management information in a network or enterprise environment. Because it is object-oriented, CIM provides abstraction, inheritance, and dependency or association relationships between objects within the model. CIM is based on XML and is platform-independent and technology neutral. The management application developer does not need any information about how CIM was implemented on a vendor product; only the API is required to interact with a vendor product.

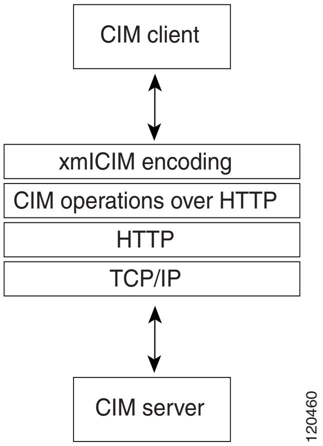
Note CIM is not supported in Cisco MDS NX-OS Release 5.2(1), but is supported in Cisco DCNM Release 5.2(1).

Note Cisco DCNM SMI-S Server is installed as part of the Cisco DCNM-SAN installation.

CIM uses a client/server model. The Cisco DCNM SMI-S Server can be embedded into the vendor product or can be implemented by a proxy server that provides the Cisco DCNM SMI-S Server functionality for the legacy vendor product. The CIM client is the management application that communicates to multiple Cisco DCNM SMI-S Servers to manage the SAN. The CIM client discovers Cisco DCNM SMI-S Servers through the Service Location Protocol, version 2 (SLPv2) as defined in RFC 2608. SLPv2 uses UDP port 427 for communication and is a discovery protocol that is separate from the CIM client/server communication path.

CIM defines the communications between the client and server in terms of technologies defined in the WEBM Initiative. Figure 1-1 shows the full CIM client/server communications path.

Figure 1-1 CIM Client/Server Communications

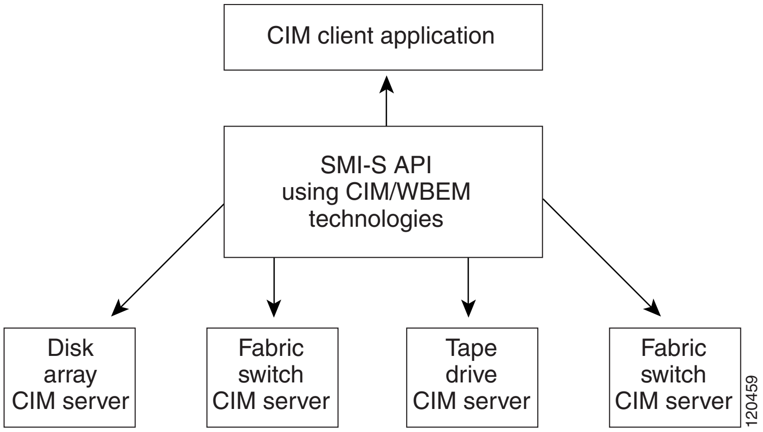


For more information about CIM, refer to the specification available through the Distributed Management Task Force (DMTF) website at http://www.dmtf.org.

About the Storage Management Initiative Specification

The Storage Management Initiative Specification (SMI-S) uses an object-oriented model based on CIM to define a set of objects and services that can manage elements of a SAN. By using a standardized architecture, SMI-S helps management application developers create common and extensible applications that work across multiple SAN vendor products. Figure 1-2 exemplifies SMI-S in a multivendor SAN.

Figure 1-2 SMI-S in a Multivendor SAN



SMI-S provides a set of standard management objects collected in a *profile*. Several profiles are defined in SMI-S that cover common SAN elements, including switches, fabrics, and zoning. These standardized profiles ensure interoperability across products within the SAN. SMI-S also defines an automated discovery process, using SLPv2. SMI-S uses CIM defined by the DMTF as part of the WBEM.

For more information about SMI-S, refer to the Storage Networking Industry Association (SNIA) website at http://www.snia.org.

About the WBEM Initiative

The WBEM initiative is a set of management and Internet standards developed to unify the management of enterprise computing environments.

The WBEM initiative includes:

- CIM, which provides a common format, language, and methodology for collecting and describing management data.
- The CIM-XML Encoding Specification, a standards-based method for exchanging CIM information. CIM-XML uses an xmlCIM encoded payload and HTTP as the transport mechanism. CIM-XML consists of the following specifications:
  - xmlCIM encoding, a standard way to represent CIM information in XML format.
  - CIM operations over HTTP, a transportation method that describes how to pass xmlCIM encoded messages over HTTP.

For more information about the WBEM initiative, refer to the DMTF website at http://www.dmtf.org.

Understanding CIM and Unified Modeling Language Notation

SMI-S relies on object-oriented classes as defined in CIM. These classes are frequently defined using Unified Modeling Language (UML). To understand the SMI-S and the Cisco extensions present in this document, you must have a basic understanding of CIM classes and UML.

Understanding CIM Classes

A class is a collection of properties and methods that define a type of object. As an example, a generic network device is a type of object. We can define the `NetworkDevice` class to describe this object. The `NetworkDevice` class contains properties or attributes of a network device. Some properties for this `NetworkDevice` class are `IpAddress` and `DeviceType`. The NetworkDevice class controls the network device. Methods and routines trigger actions on the network device. Example of methods are enablePort() and rebootDevice().

After defining a `NetworkDevice` class, we can define a class for just switches. Because a switch is a special type of `NetworkDevice`, we use the object-oriented concept of *inheritance* to define the `Switch` class. We define the `Switch` class as a child of the `NetworkDevice` class. This means the `Switch` class automatically has the properties and methods of its parent class. From there, we add properties and methods that are unique to a switch.

CIM defines a special type of class called an *association class*. An association class represents relationships between two or more classes. As an example, we define an association class to show the relationship between a `NetworkDevice` class and an `OperatingSystem` class. If there is a many-to-one or many-to-many relationship, the association class is considered an *aggregation*.

Refer to http://www.dmtf.org for a full explanation of CIM.

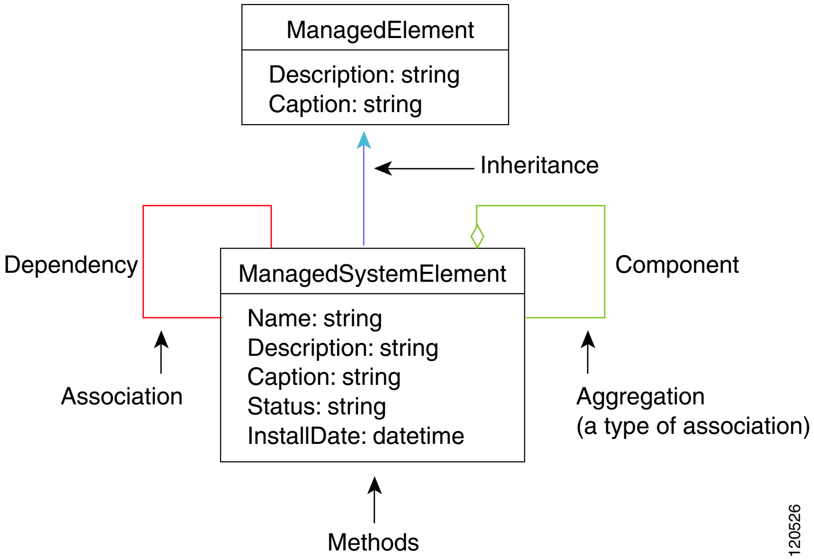
Understanding UML

UML provides a visual representation of the classes that describe a product or technology. UML contains many visual elements, but only a subset are described here. Refer to http://www.uml.org for a full explanation of UML.

Figure 1-3 shows an example section from a UML diagram for CIM classes. This diagram shows:

- blue lines for inheritance between classes
- green lines for aggregation between classes
- red lines for associations between classes

Figure 1-3 UML Example Diagram



About SMI-S and CIM in Cisco DCNM for SAN

SMI-S defines a number of profiles that specify the managed objects used to control and monitor elements of a SAN. Each switch or director in Cisco DCNM for SAN includes an embedded Cisco DCNM SMI-S Server. The Cisco DCNM SMI-S Server communicates with any CIM client to provide SAN management compatible with SMI-S. The Cisco DCNM SMI-S Server includes the following standard profiles, subprofiles, and features as defined in SMI-S:

- Service Location Protocol version 2 (SLPv2)
- Server profile
- CIM indications
- Fabric profile

  - Zoning Control subprofile
  - Enhanced Zoning and Enhanced Zoning Control subprofile
  - FDMI subprofile
- Switch profile, including the Blade subprofile and Access Point subprofile
- xmlCIM encoding and CIM operations over HTTP as specified by the WBEM initiative
- HTTPS, which uses Secure Socket Layer (SSL)

  HTTPS is optional but provides enhanced security by encrypting communications between the Cisco DCNM SMI-S Server and the CIM client.