Oracle Enterprise Manager 10*g* : Management Standards Overview

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EXECUTIVE OVERVIEW

The Grid computing paradigm requires scalable management at all levels of the technology stack. For example, ten years ago a single DBA could manage at most a few databases. Today, Giga Research says that the typical DBA (for any brand of database) manages 20 to 30 databases. With Grid computing, an administrator may manage hundreds and possibly thousands of databases and application servers at a time. Tools and techniques that depend on proprietary protocols to manage individual systems will not be effective. The solution is to enable technology vendors to automate the management of their individual components and then to integrate these components into comprehensive management solutions through the use of open Management standards.

Management standards define consistent information models and communication protocols that benefit both providers and consumers of management data. Model-based management frameworks provide the semantics and technical details necessary for cooperative management vendors to consistently represent management information across the enterprise. This technical white paper provides an overview of the current management standards and explains how they complement the value added capabilities that are available in Enterprise Manager 10*g* – Oracle's single, integrated solution for administering and monitoring clusters of applications and systems that are based on the Oracle technology stack.

INTRODUCTION

The management domain has a number of competing standards that are present in the market. Each management standard must be evaluated based on its potential customer benefit, market acceptance, and technical merit. Other factors, such as integration with other standards and the availability of open source reference implementations should also be considered when choosing management standards.

Management standards are important because the technology that a customer needs to manage spans organizational and vendor boundaries. They enable collaboration on integrated information models that provide consistent processes and operations. The immediate customer benefit of management standards is the reduced

operational costs from a more integrated, cost-effective information technology infrastructure. Standards provide an extensible, open framework of common protocols and an information model that enable the development of more highly integrated management solutions.

This white paper describes several management standards that are available in the enterprise market today. It explains their strengths and weaknesses, and identifies the opportunities presented by them. It shows how management standards complement the value added capabilities that are available in Enterprise Manager. The white paper also describes the integration points that are available within the Enterprise Manager architecture for monitoring, configuration, and administration.

MANAGEMENT STANDARDS OVERVIEW

There are a number of standards organizations and industry groups who are actively producing standards that are applicable to the enterprise management domain. For example, The Open Group has published several specifications in the area of application management, including the application response measurement (ARM) standard [ARM2001], which has received a good deal of industry attention and vendor adoption in recent years. The Object Management Group (OMG) has produced a number of standards and technologies to enable modeling and distributed application development across the complete software lifecycle. OMG standards include The Common Object Request Broker Architecture (CORBA) specification [CORBA2001] for application interoperability and the Common Warehouse Metamodel [CWM2001], which defines consistent schemas in the data warehouse domain. Industry organizations like The Open Group and the OMG produce standards that can be applied to enterprise management problems, so their contributions should not be ignored.

The Internet standards published by the Internet Engineering Task Force (IETF) have been the most widely adopted by database vendors. This organization developed the Simple Network Management Protocol (SNMP) that contains the RDBMS Management Information Base (MIB) as defined in RFC 1697 [RFC1697].

The Common Information Model (CIM) [CIM1999] published by the Distributed Management Task Force (DMTF) has united technology vendors through a consistent management model. An associated initiative for Web-Based Enterprise Management (WBEM) defines how CIM enabled clients can communicate through standard Internet technology such as the Hypertext Transfer Protocol (HTTP) [WBEM1999a] and the Extensible Markup Language (XML) [WBEM1999b].

Java-based applications or J2EE applications that are deployed using the Oracle9i application server can take advantage of the Java Management Extensions (JMX) as a management framework. JMX evolved from the JMAPI specification produced through the Java Community Process (JCP) as the JSR-3 specification [JMX2000].

Today, the JMX standard is the definitive framework for Java management and monitoring.

More recently, the Global Grid Forum (GGF) [GGF2003] and the OASIS Web Services Distributed Management technical committee [OASIS2003] have made headway in identifying and solving management issues as resources and applications are distributed across the enterprise.

Simple Network Management Protocol (SNMP)

The IETF is a loosely organized body of technical professionals who are interested in the development of new Internet standard specifications. The IETF held its first meeting in January 1986 in San Diego, California. The majority of the work done by the IETF is through working groups. Working groups have a charter, a chair, and members who communicate through an email list. There are currently over one hundred working groups at the IETF [RFC3160].

The RDBMS working group published the RDBMS MIB in August 1994. It defined approximately 55 metrics that covered database and database server vendor independent performance and configuration information. The Management Information Base (MIB) was widely adopted by database vendors in SNMP version 2. It is the most widely accepted standard for sharing database management content between cooperative management vendors.

The major advantages of SNMP are its wide adoption rate and the low overhead of the SNMP protocol for transferring management information.

There are several known drawbacks with the SNMP version 2 protocol. First, the SNMP protocol in version 2 was not secure. Additional work was required by the vendor to ensure that sensitive management information was not exposed inappropriately. H. Erik Hia presented a number of solutions to the security problem in his master's thesis [HIA2001]. Other documented drawbacks with the SNMP version 2 protocol include the use of IP addresses in the communication protocol, which introduces complexity when communicating through a firewall. Also, the MIB structure is represented in a hierarchical structure, which is not easily extensible [LOPES2000].

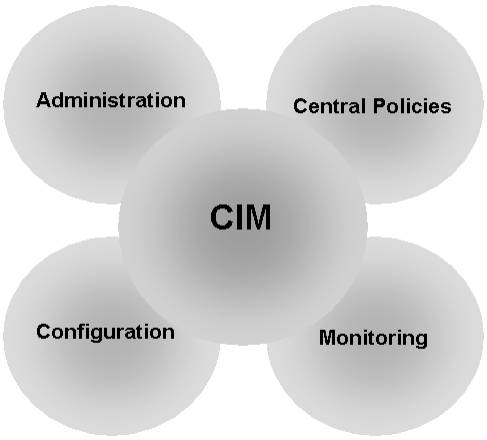
A number of these issues were addressed in SNMP version 3.

Common Information Model (CIM)

The DMTF's common information model consists of a core information model and a set of common models that extend from the core to provide consistent management content for all levels of the technology stack. CIM models cover hardware aspects of the management environment from low-level devices through networks. The models also describe software components from the operating system, database, application server, through to the application. In addition, information models have also been developed to specify consistent management content for areas such as users, security, policy and support. The strengths of CIM

include the richness of the information models and its object-oriented representation, which allows modelers to extend from existing classes to include vendor or organization specific content.

CIM describes the management entities, their composition, and interrelationships. Model contents are not bound to a particular implementation. CIM consistently describes the contents and semantics of manageable entities for the entire enterprise. CIM provides an abstraction layer for the interchange of management information between management systems and management clients or applications. More detailed information on CIM can be found in the CIM Technical Note [CIM2003] on the DMTF web site.



Web-Based Enterprise Management (WBEM)

The easiest way to conceptualize the relationship between CIM and WBEM is to think of CIM as the management schema and WBEM as the DMTF initiative that describes how to perform operations using the schema from a client using standard Internet technology.

Web-Based Enterprise Management (WBEM) is built upon standard Internet technologies such as XML and HTTP. It includes the CIM-XML protocol, which provides an Internet friendly mechanism for accessing CIM schema content. WBEM was developed to help management application providers to unify the management of enterprise computing environments. WBEM provides the ability for a client application to access the contents of a CIM schema for monitoring, administration, and configuration management. CIM-XML is one of several protocols that management vendors have been adopting to communicate

management content in an Internet friendly way. Others include SOAP/WSDL, OMI, and JMS.

The Global Grid Forum (www.gridforum.org) is a DMTF alliance partner. The GGF and the DMTF are collaborating on management modeling and services in support of grid computing. The formal work register that explains the relationship in more detail can be found under the member area of the DMTF web site.

Java Management Extensions (JMX)

The Java management extension (JMX) provides a comprehensive management framework for the Java environment. It has been defined through the Java community process by a number of specifications that cover basic Java management, Java messaging services, and J2EE application management. The JCP was originally created by Sun Microsystems in 1995 as an informal forum to get feedback from Java developers. It has evolved into a formalized process overseen by representatives from many organizations across the Java community.

JMX is a distributed, model agnostic, management framework for building enterprise wide management applications. Like Java, JMX provides a great deal of flexibility to dynamically create or update management entities, or perform management operations. JMX includes a set of APIs, as defined in JSR 48, that supports the client portion of the CIM operations over HTTP specification.

JMX can be used with several different protocols for communicating with a client application. These include the Java Messaging service (JMS) that was developed for use within an enterprise, or JAXM, which is an XML-based messaging protocol that was designed for use across the Internet.

ENTERPRISE MANAGER INTEGRATION

Enterprise Manager (EM) is Oracle's central management solution for managing, monitoring and tuning the complete Oracle environment. Since most enterprise environments include custom software and hardware modules, and they require the same level of management that are provided by EM, standards integration allows these custom solutions to leverage the EM management infrastructure for event monitoring, real time diagnostics, and service level reporting. One of the main goals of Enterprise Manager is to facilitate the acquisition of management content from custom software and hardware modules and be able to publish it in a standard way.

EM allows management service providers and cooperative management vendors to utilize any of the major management standards and still take advantage of the Enterprise Manager value added capabilities such as historical collections metric rollup and reporting, baselines, centralized policies, and notifications.

Enterprise Manager integrates with managed targets that use a standard protocol for management. The Oracle agent is the integration point for monitoring and

configuration information. Fetchlets, which are parameterized data access mechanisms, are available to map relevant data from a managed target into Enterprise Manager's metric form. In the standards area, Enterprise Manager currently has an SNMP fetchlet to pull content from SNMP targets, and a WBEM fetchlet to collect management content from a WBEM Server.

Future versions of Enterprise Manager will provie additional integration capabilities to management standards. For example, a JMX fetchlet to collect information through JMX is in development. In addition, a mechanism to expose Oracle specific management information for WBEM clients is underway.

CLOSING REMARKS

The primary customer benefit from Oracle's involvement in the various management standards organizations is consistent management content across vendors and platforms, which reduces the total cost of ownership (TCO) for the Oracle environment.

Management standards such as CIM, WBEM, and JMX allow Oracle's developers to better integrate management capabilities across technology vendors so that customers can better manage the complete Oracle environment - and get a more complete solution rather than separate, vendor specific management applications. They also help customers who invest in standards-based management solution to more easily integrate components across vendors.

This white paper has provided a short introduction to the primary management standards initiatives that are underway across the industry. These standards compliment the value added capabilities that Oracle delivers with Enterprise Manager 10*g*.

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