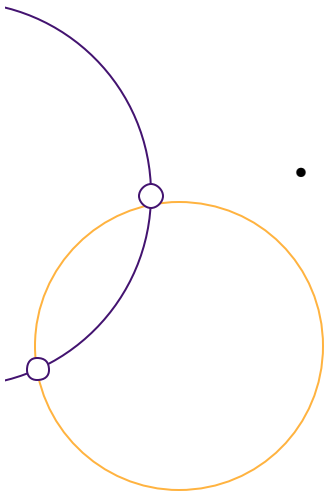**M*Ware TMN Manager Development Environment**

The TMN Manager Development Environment (TMN MDE) is one of the main components of our development platform. TMN MDE enables developers to easily build customizable, dynamically configurable, scalable, TMN-conformant managers.

Highlights

- Vertel's MDE is part of our complete TMN development toolkit, which is the most professional, reliable and proven technology solution available in the Market.

- Vertel sold MDE (and other TMN parts like agent developer and simulators) to many major equipment vendors (including Alcatel, NTT, Nortel and Lucent) and incumbent operators (including AT&T, BT and Deutsche Telekom) all over the world.

- Vertel has all the knowledge related to TMN management in house, and available for customer projects and product support. In fact, many of the TMN standards were developed by committees that included Vertel experts.

- The M*Ware TMN MDE automates most of the tasks associated with building a manager application and leads the project team through each stage of manager application development - design, implementation, testing, and deployment.

- MDE provides an object-oriented development environment which is highly customizable to any specific Manager needs

- MDE can be integrated easily with any existing Management application to provide CMISE functionality

- MDE greatly reduces the application development time through integration with code-generation capability of the TMN Manager Simulator

- Dynamic MIB Loading features make it possible to develop generic Manager applications where the MIB is loaded at runtime without recompilation (the MIB is translated into metadata, that can be loaded dynamically)

- MDE fully supports and implements the TMF TMN/C++ High Level API (TMF API)

- MDE uses ANSI C++ STL supported data types (standard template library)

- The MDE fully integrated environment includes the fully compliant higher layers OSI protocol stack—so no additional third-party tools are needed

- The MDE provides ability to develop a prototype CMIP manager in minutes, based on any standards-conformant MIB
- MDE building blocks are platform-independent, but have been tested in the following platform configurations:
    - Windows/NT 4.0 and Windows 2000
    - Sun Solaris 2.6 – 2.8
    - AIX 5.1
    - HPUX 11.x

- MDE interoperates with any compliant CMIP agent, including the M*Ware TMN Simulator as well as agents developed with the M*Ware TMN Agent Development Environment (ADE).

Components

The M*Ware TMN MDE components are described in the following sections.
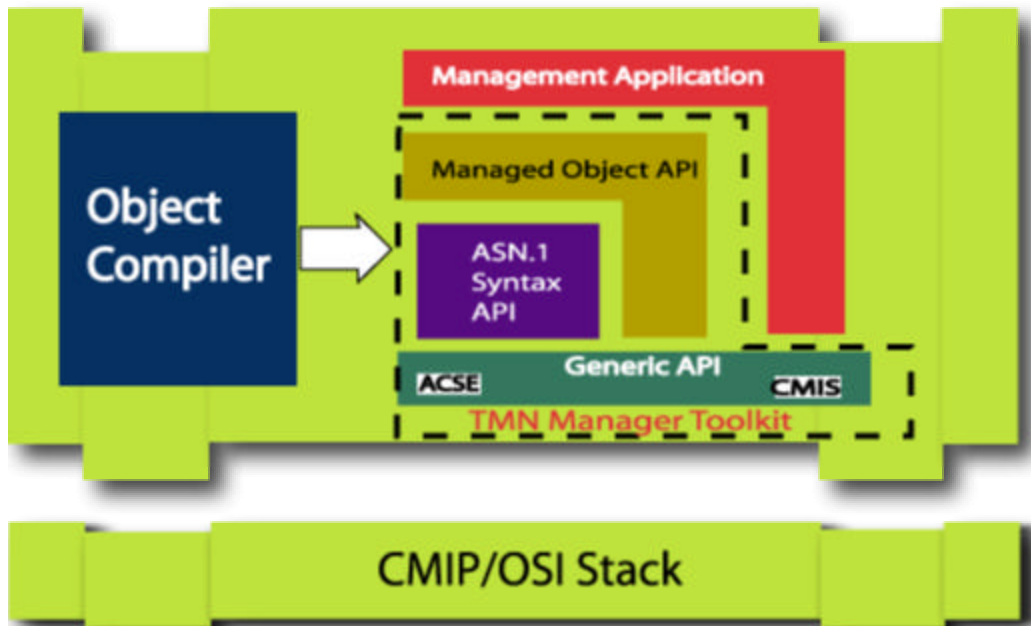
Example implementation

The TMN Manager Development product includes a memory based example implementation of a CMIP Manager which can be loaded within minutes. This manager is fully capable of handling any CMIP operations and can be used as a template for the actual Management system.

Using M*Ware MDE, only the part of the code which defines the details of the specific agents that need to be managed, has to be generated manually by the developer. All the generic functions are provided by the Vertel TMN Manager Toolkit.
The code produced by the ASN.1/GDMO Object compiler and the code produced by the developer are integrated with the core Manager functions, and the TMN Manager is produced.

TMN Manager Toolkit

The TMN Manager Toolkit is provided in an easy-to-implement toolkit form. Its customizable C++ classes hide the complexities of CMISE and ACSE primitives. The TMN Manager Toolkit's exposed interface is the TMF TMN/C++ high level API, referred to as the TMF API, which provides consistent interfaces for CMISE, GDMO, and ASN.1. Because the TMF API hides the implementation details, you can focus on building applications and do not need to know about the details of CMISE, ASN.1 or GDMO.

The Manager Toolkit includes features which makes it possible to choose between the static C++ API or choose to dynamically load the Information Model (MIB) at run-time.

The MIB can be updated "on the fly" and the application does not have to be brought down and rebuilt. This substantially reduced the development testing cycle.

The dynamic loading further allows the developer to write the application in such a way, that the resulting applications do not need to be brought down either, once in operations. This is a key competitive advantage for network operators.

The Manager Toolkit provides the customer with both a generic and a specific interface. The generic interface is MIB independent and gives the customer full access to all ACSE/CMISE functionality. The combination of a generic interface and dynamic MIB loading makes it possible to develop Information Model- independent managers. This can be of very high value, since it dramatically increases re-use.

The specific or Managed Object API is generated by the TMN Object Compiler and provides a C++ class for each managed object class defined in GDMO. The Managed Object API provides access to, and operations on, managed objects and all their properties (attributes, notifications and actions).

The application developer has a choice of using either the generic API, specific API, or both which provides for greater flexibility during application development.

The TMF API's reusable C++ objects let you perform iterative testing; you can easily test independent objects, so that you test only the changes to the MIB instead of the entire information base.

M*Ware TMN Object Compiler

By using the TMN Object Compiler, you can skip the tedious and error-prone task of writing code for managed object classes.

The TMN Object Compiler generates the C++ interface to your GDMO and ASN.1 MIB specifications. This generated C++ interface conforms to the TMF API.

Besides C++ code, the TMN Object Compiler can generate an HTML version of the MIB based on your input file(s). This HTML-formatted MIB can then be viewed by any HTML-compatible browser.

The TMN Object Compiler compiles GDMO and ASN.1 notation from one or more input files. You do not need separate compilers and you do not need to link separate compiler output forms. You can use the files in their standard form, or you can customize input by using non-intrusive directives.

TMN CMISE OSI Protocol Stack

The TMN CMISE conforms to the TMF API's CMISE implementation, with full common management information services (CMIS), as well as all application layer services and OSI upper layers.

The OSI upper layers provide support for ROSE, ACSE, PRESENTATION and SESSION. TMN CMISE is manager/agent role-independent, and its interface is platform-independent to ease portability. TMN CMISE also includes interfaces to all available transport products. M*Ware includes compatible products to support all seven layers of the OSI reference model, as well as TCP/IP.
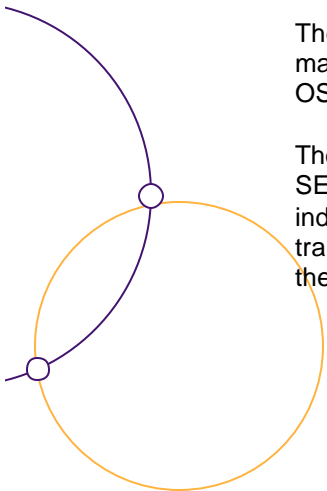
Standards Conformance

- ITU X.200: Reference Model for OSI
- ITU X.209: Specification of BER for ASN.1
- ITU X.213: Network Layer Addressing
- ITU X.701: Systems Management Overview
- ITU X.710: CMISE Definition
- ITU X.711: CMIP Specification
- ITU X.720: Management Information Model
- ITU X.721: Definition of Management Information
- ITU X.722: Guidelines for Definition of Managed Objects
- ITU X.730, X.731, X.732, X.733, X.734, X.735, and X.736: Systems Management Functions
- ITU Q.822: Stages 1, 2, and 3 Description of Q3
- TMF: OmniPoint 2.0
- TMF: TMN C++ High Level API

Vertel M*Ware is a complete product line of pre-built and customizable components and solutions for easy network management development and integration. M*Ware's distributed, model driven architecture ensures that Management systems (Managers/Agents) as well as integration with networks and other OSSs are efficient, maintainable and highly re-usable.

About Vertel

Vertel is a leading provider of convergent service management mediation solutions.

Since 1995, Vertel has provided network management, mediation and integration solutions to both telecom infrastructure vendors and service providers such as Alcatel, Nokia, Motorola, Lucent, Nortel, NTT, Samsung, AT&T, BT, Deutsche Telekom, Cingular and Williams Communications.

Vertel's in-depth knowledge and commitment to industry standards, combined with experience of working with many different equipment types, creates high performance solutions that enable customers to quickly cross technological barriers. Vertel's mission is to make its customers successful by enabling them to reduce operational costs and introduce new services, networks and OSSs while leveraging existing investments.

Vertel's core product offering, M*Ware, allows seamless management in multi-technology and multi-vendor environments. M*Ware offers a full suite of mediation based applications that can address protocol translation, data transformation, element and network management, OSS application integration, and OSS exchange services. M*Ware components are highly scalable and are very suited for mission critical operational environments. Vertel's Professional Services organization develops customized communications software solutions tailored to individual customer requirements, and also offers project management, systems analysis and other technical services.

Vertel is based in Woodland Hills, California and has sales offices throughout the world.
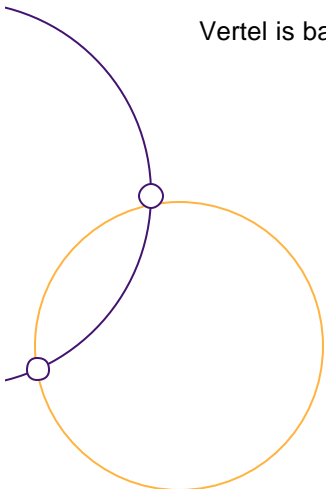
Related M*Ware Products

The following products are also available from Vertel, and compliment the M*Ware TMN Manager Development Environment:

M*Ware TMN Manager Simulator

Use the TMN Manager Simulator in order to test your TMN ADE-developed agent application during every phase of application development. .

Both the TMN Agent and Manager TMN Simulator use TCL scripts to emulate the behavior of a fully-implemented Q3-conformant management entity.
TCL scripts are platform-independent and allow scripts to be re-used across implementations. The TMN Simulator's test scripts can be executed interactively or in batch mode. The built-in TCL interpreter evaluates all scripts and executes specific behaviors.

M*Ware TMN Agent Simulator

Use the TMN Agent Simulator
- To test your manager applications during every phase of application development
- As a script-driven *agent*, so that you can compare the behavior with your own agent application's behavior.

The TMN Agent Simulator can generate the necessary specific C++ application code for your Agent development. This code can be used directly within the Agent Development Framework.

M*Ware TMN Agent Development Environment (ADE)

The Vertel TMN Agent Development Environment (TMN ADE) is one of Vertel's most popular products, it is of course fully compatible (and recommended) for use with the TMN MDE.
Like the TMN MDE, the TMN Agent Development Environment's user interface conforms to the TMF API. The TMF API provides a consistent interface for developing both manager and agent applications, thus promoting reusability across application development projects and reducing training costs and learning curves. Read our M*Ware ADE datasheet for more details.

M*Ware TMN-UTS

M*Ware Unix/NT telecommunication solutions (UTS) provide standards-conformant open systems interconnection (OSI) transport products that includes data transmission services (the lower layers) for any OSI-conformant application such as CMIP applications, and File Transport, Access, and Management (FTAM). UTS-Netlink contains UTS-TCP (RFC-1006), UTS-WAN (X.25) and UTS-LAN (CLNP) protocol stacks and is supported on Solaris, HP-UX, Windows NT and Windows 2000, and AIX.

M*Ware Convergent Manager and Agent Development

M*Ware also offers a manager and agent development environment for many different protocols, including TMN CMIP, but also SNMP, CORBA, TL-1, ASCII, XML, etc. Please read the dedicated datasheets about these products, that include many of the specific TMN features explained here, but can contain adapters and support libraries for other protocols as well. This ideal environment enables you to build equipment and networks for the multi-technology, multi-protocol services requested today!