# *Introduction* *1*

## *1.1 The OMG Vision*

The CPU as an island, contained and valuable in itself, is dying in the nineties. The next paradigm of computing is distributed or cooperative computing. This is driven by the very real demands of corporations recognizing information as an asset, perhaps their most important asset.

To make use of information effectively, it must be accurate and accessible across the department, even across the world. This means that CPUs must be intimately linked to the networks of the world and be capable of freely passing and receiving information, not hidden behind glass and cooling ducts or the complexities of the software that drives them.

### *1.1.1 Current Problems*

The major hurdles in entering this new world are provided by software: the time to develop it, the ability to maintain and enhance it, the limits on how complex a given program can be in order to be profitably produced and sold, and the time it takes to learn to use it. This leads to the major issue facing corporate information systems today: the quality, cost, and lack of interoperability of software. While hardware costs are plummeting, software expenses are rising.

As information systems attain strategic importance and represent the key competitive edge to the industry leaders, the cost of inaccuracies or delayed implementations is attenuating entire MIS departments. As systems departments require information among a diversity of inhouse, brought-in, supplier, customer, and commercial applications, those applications become increasingly difficult and complex.

## *1.1.2  The OMG Solution*

The Object Management Group (OMG) was formed to help reduce complexity, lower costs, and hasten the introduction of new software applications. The OMG plans to accomplish this through the introduction of an architectural framework with supporting detailed interface specifications. These specifications will drive the industry towards interoperable, reusable, portable software components based on standard object-oriented interfaces.

The OMG is an international trade association incorporated as a nonprofit in the United States. The OMG receives funding on a yearly dues basis from its diverse membership of more than 700 corporations. The OMG is headquartered in Framingham, Massachusetts, and has marketing offices in Frankfurt, Germany; Tokyo, Japan; and Hounslow, England. The OMG also sponsors the world's largest exhibition and conference on object technology, Object World. The mission of the OMG is as follows:

- The Object Management Group is dedicated to maximizing the portability, reusability, and interoperability of software. The OMG is the leading worldwide organization dedicated to producing a framework and specifications for commercially available object-oriented environments.

- The Object Management Group provides a Reference Architecture with terms and definitions upon which all specifications are based. Implementations of these specifications will be made available under fair and equitable terms and conditions. The OMG will create industry standards for commercially available object-oriented systems by focusing on Distributed Applications, Distributed Services, and Common Facilities.

- The OMG provides an open forum for industry discussion, education, and promotion of OMG-endorsed object technology. The OMG coordinates its activities with related organizations and acts as a technology/marketing center for object-oriented software.

The OMG defines the object management paradigm as the ability to encapsulate data and methods for software development. This models the "real world" through representation of program components called "objects." This representation results in faster application development, easier maintenance, reduced program complexity, and reusable components. A central benefit of an object-oriented system is its ability to grow in functionality through the extension of existing components and the addition of new objects to the system.

The software concept of "objects," as incorporated into the technology of the Object Management Group, will provide solutions to the software complexities of the 1990s. Object-oriented architectures will allow applications acquired from different sources and installed on different systems to freely exchange information. Software "objects" will mirror the real world business objects they support, in the sense that the architect's blueprint mirror a building. The OMG envisions a day where users of software start

up applications as they start up their cars, with no more concern about the underlying structure of the objects they manipulate than the driver has about the molecular construction of gasoline.

## 1.1.3  Goals of the OMG

The members of the Object Management Group have a shared goal of developing and using integrated software systems.  These systems should be built using a methodology that supports modular production of software; encourages reuse of code; allows useful integration across lines of developers, operating systems and hardware; and enhances long-range maintenance of that code.  Members of the OMG believe that the object-oriented approach to software construction best supports their goals.

Object orientation, at both the programming language and applications environment levels, provides a terrific boost in programmer productivity, and greatly lends itself to the production of integrated software systems.  While not necessarily promoting faster programming, object technology allows you to construct more with less code.  This is partly due to the naturalness of the approach, and also to its rigorous requirement for interface specification.  The only thing missing is a set of standard interfaces for interoperable software components.  This is the mission of the OMG.

Member companies join the OMG because they see themselves in a position to capitalize on a decade's work in object-oriented development by constructing a real system based on a vision of a distributed object-oriented architecture for application development.  A major goal is to define a living, evolving standard with realized parts, so that applications developers can deliver their applications with off-the-shelf components for common facilities like object storage, class structure, peripheral interface, user interface, etc.  The function of the OMG is then to promulgate the standard specifications throughout the international industry, and to foster the development of tools and software components compliant with the standard.

## 1.1.4  The OMG Process

The OMG Board of Directors approves the standard by explicit vote on a technology-by-technology basis.  The OMG Board of Directors bases its decisions on both business and technical merit.  As portions of the reference model are proposed to be filled by various vendors' software specifications, the standard grows.  The purpose of the OMG Technical Committee (TC) is to provide technical guidance and recommendations to the Board in making these technology decisions. An end-user special interest group likewise guides the Board toward decisions in the best interests of technology users.

The TC is composed of representatives of all OMG member companies (Corporate, Associate, and End User), with similar voting provisions to the Board's voting structure.   It is operated by a Vice President of Technology, working full-time for the OMG (as opposed to being employed by a member company).  The TC operates in a Request for Proposal (RFP) mode, requesting technology to fill open portions of the reference model from the international industry. (This document  lays the groundwork for technology response to our Requests for Proposals and subsequent adoption of

specifications.)  The responses to an RFP, taken within a specific response period, are evaluated by a Task Force of the Technical Committee. Then, the full TC  votes on a recommendation to the Board for approval of the proposed addition to the standard. Once a technology specification (not source code or product) has been adopted, it is promulgated by the OMG to the industry through a variety of distribution channels. There also exists a somewhat faster model for adopting standards, one that is based on Requests for Public Comment (RFC).

## 1.2   Benefits of Object Management

As previously mentioned, the technological approach of object technology (or object orientation) was chosen by the OMG founders not for its own sake, but in order to attain a set of end user goals.  End users benefit in a number of ways from the object-oriented approach to application construction:

- An object-oriented user interface has many advantages over more traditional user interfaces.  In an object-oriented user interface, Application Objects (computer simulated representations of real world objects) are presented to end users as objects that can be manipulated in a way that is similar to the manipulation of the real world objects.  Examples of such object-oriented user interfaces are realized in systems such as Xerox Star, Apple Macintosh, NeXTStep from NeXT Computer, OSF Motif and HP NewWave, and to a limited degree, Microsoft Windows. CAD systems are also a good example in which components of a design can be manipulated in a way similar to the manipulation of real components. This results in a reduced learning curve and common "look and feel" to multiple applications. It is easier to see and point than to remember and type.

- A more indirect end-user benefit of object-oriented applications, provided that they cooperate according to some standard, is that independently developed general purpose applications can be combined in a user-specific way.  It is the OMG's central purpose to create a standard that realizes interoperability between independently developed applications across heterogeneous networks of computers. This means that multiple software programs appear as "one" to the user of information no matter where they reside.

- Common functionality in different applications (such as storage and retrieval of objects, mailing of objects, printing of objects, creation and deletion of objects, or help and computer-based training) is realized by common shared objects leading to a uniform and consistent user interface.

- Sharing of information drastically reduces documentation redundancy.  Consistent access across multiple applications allows for increased focus on application creation rather than application education.

- Transition to object-oriented application technology does not make existing applications obsolete.  Existing applications can be embedded (with different levels of integration) in an object-oriented environment.

• Pragmatic migration of existing applications gives users control over their computing resources, and how quickly these resources change.

• Likewise, application developers benefit from object technology and object-oriented standards. These benefits fall into two categories:

  •Through encapsulation of object data (making data accessible only in a way controlled by the software that implements the object) applications are built in a truly modular fashion, preventing unintended interference. In addition, it is possible to build applications in an incremental way, preserving correctness during the development process.

  •Reuse of existing components. Specifically, when the OMG standard is in effect, thereby standardizing interaction between independently developed applications (and application components), cost and lead time can be saved by making use of existing implementations of object classes.

• In developing standards, the OMG keeps these benefits of object orientation in mind, together with a set of overall goals:

  •Heterogeneity. Integration of applications and facilities must be available across heterogeneous networks of systems independent of networking transports and operating systems.

  •Customization options. Common Facilities must be customizable in order to meet specific end-user or organizational requirements and preferences.

  •Scope. The scope of OMG adopted technology is characterized by both work group support and mission critical applications.

  •Management and control. Issues such as security, recovery, interruptibility, auditing, and performance are examined.

  •Internationalization. As the OMG is itself an international group, the standard reflects built-in support for internationalization of software.

  •Technical standards. Standards to meet these user goals are the central goal of the OMG, as well as the content of this manual.

*A Discussion of the Object Management Architecture*