Open Blueprint: IBM's Guide to Distributed Computing

AIX

The Open Blueprint, a comprehensive structure of components, makes it easier than ever to design, implement, and manage industry-standard client/server applications.

The Open Blueprint offers a set of guidelines that will make it easier for software developers—whether they are at IBM, other software vendors, or other system vendors—to produce products that are truly interoperable," said Martin C. Clague, IBM's general manager, Worldwide Client/Server Computing. "Businesses want to know that their investments in information technology will endure as they transform their systems to more productive client/server models. The real beauty of the Open Blueprint is that it gives them the confidence to proceed knowing that we understand what they want and their investments are secure."

IBM has worked closely with international standards organizations, industry consortia, customers, and industry leaders to determine the most widely accepted standards available today that allow IBM products to interact with other vendors' products and with each other.

Because IBM product divisions support the Open Blueprint, customers will be able to develop new client/server applications while preserving their existing applications.

Overview

The Open Blueprint addresses the challenges of the open environment by viewing a system as part of a distributed network and viewing the network as if it were a single system. The Open Blueprint serves four major roles:

- Helps customers develop their own architectures and organize products and applications in an open distributed environment
- Describes IBM's directions for products and solutions in the open distributed environment
- Guides developers as they supply products that include the appropriate functions, and products that can be integrated and interoperate with other installed products
- Provides a context for incorporating new technologies into a distributed environment

A major goal of the Open Blueprint is to enable a single-system view of the network, masking the complexities of the physical network environment from users. The Open Blueprint structure allows a network of operating systems to function as a unit—as a network operating system. A *network operating system* consists of multiple separate systems connected by a network. In the network operating system enabled by the Open Blueprint, each individual system logically contains the services described below. However, it is not necessary for each individual system to physically contain all the services included in the Open Blueprint.

Just as an operating system manages resources on a single system, a network operating system manages the same types of resources (files, databases, printers, transactions, software packages, documents, jobs, and so on) across a network. The equivalent facilities or services in each individual system work together to provide support for distributed and client/server applications. Figure 1 represents one instance of a system in the network operating system.

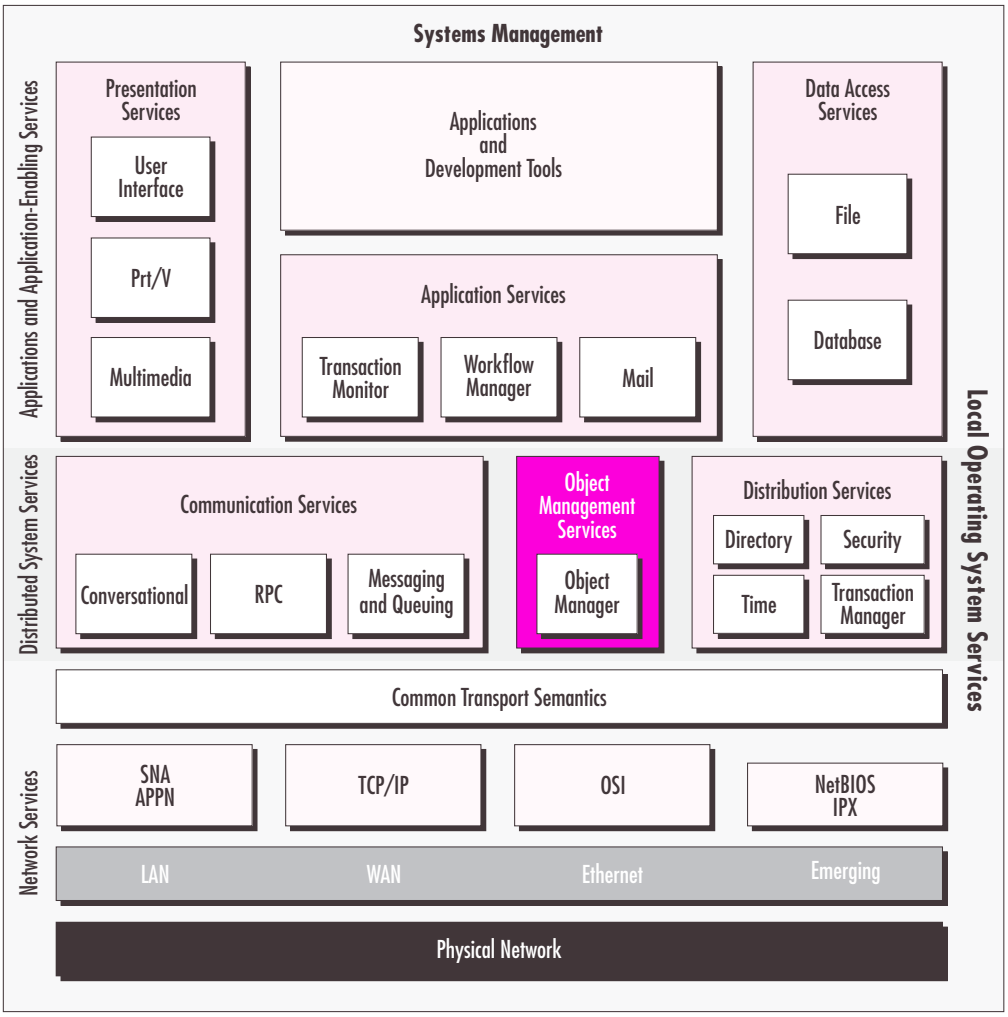

Figure 1. The Open Blueprint

Figure 2 shows the sets of resource management services defined in the Open Blueprint and shown in Figure 1.

The Open Blueprint promotes the integration of multivendor systems and simplifies the more cumbersome aspects of distributed computing, such as multiple logons, multiple passwords, and unique application directories for locating resources. Products that align with the Open Blueprint provide designated interfaces and protocols. Products that use resource managers defined within the Open Blueprint rather than their own unique mechanisms are truly integrated with the Open Blueprint. For example, if every application uses its own unique security facility, a user must present a unique password for each application. If applications and resource managers use the security services from the Open Blueprint, a single user password will suffice for the cooperating applications. This integration improves the single-system image of the distributed system as perceived by the end user and application developer.

The Open Blueprint includes interfaces and protocols from IBM and other industry sources. Those from industry sources are broadly accepted standards, many of which are included in X/Open's® Distributed Computing Services (XDCS) framework.

The boxes in Figure 1 do not correspond to specific products. The Open Blueprint is imple-

mented by different products on different system platforms. Although the Open Blueprint does not describe how the implementing software is packaged into offerings, it does describe the technical attributes and characteristics of supporting software, reflects desirable functional modularity, provides software principles and guidelines, and specifies important boundaries and interfaces.

The Open Blueprint describes techniques for building an open, heterogeneous, distributed system that is extensible by alternate component implementation and by support for evolving new technologies and functions. For example, the Open Blueprint currently supports three models for interprocess communication: conversational, Remote Procedure Call (RPC), and messaging and queueing. If a fourth model were to be developed, it would be evaluated for inclusion. Because the Open Blueprint is modular, the fourth model would easily fit in with the other three. However, if a new technology emerged in the area of one of the existing models, the Open Blueprint would not have to be modified. The new technology would potentially have a great impact on implementation and integration, but it is handled architecturally within the existing structure.

Existing products currently provide many functions described in the Open Blueprint, but additional functionality and product implementations will be provided to the Open Blueprint. Because standards are included in the Open Blueprint, components from different providers can be mixed and matched in the distributed network.

Object technology is key to the evolution of the Open Blueprint. Objects are expected to become more prevalent in applications and in system and network components. Coexistence with procedural elements is accommodated in the structure of the Open Blueprint. Basic object management services will be extended and expanded to satisfy both transitional, mixed environments, and full object-oriented implementations. Over time, many parts of the Open Blueprint will be affected by object technology, including new object-oriented services and new interfaces for existing services.

Network Services

- **Common Transport Semantics** supports protocol-independent communication in distributed networks.
- **Transport Network Services** provide the protocols for transporting information from one system to another, such as System Network Architecture/Advanced Peer-to-Peer Networking (SNA/APPN), TCP/IP, Open Systems Interconnection (OSI), NetBIOS, and IPX.
- **Subnetworking** provides functions dealing with specific transmission facilities, such as various kinds of LANs, WANs, channels, and emerging technologies such as wireless and Asynchronous Transfer Mode (ATM).

Distributed System Services

- **Communication Services** provide mechanisms for parts of a distributed application or resource manager to talk to each other.
- **Object Management Services** provide transparent access to local and remote objects.
- **Distribution Services** assist the communication between parts of distributed applications and resource managers by providing common functions such as a directory and security.

Application-Enabling Services

- **Presentation Services** define the interaction between applications and the user.
- **Application Services** are common functions (such as mail) that all applications can use.
- **Data Access Services** allow applications and resource managers to interact with various types of data.
- **System Management Services** provide either facilities for a system administrator or automated procedures to manage the network operating system.
- **Local Operating System Services** operate within the confines of a single system in a network, such as managing memory and dispatching work.
- **Development Tools** help the application developer implement distributed applications that use standard interfaces.

Figure 2. Sets of resource management services

Summary

In their book *Paradigm Shift* (McGraw-Hill Inc., 1993), Don Tapscott and Art Caston summarize the need for standards as follows:

> Leading organizations everywhere are embracing the concept of a standards-based architecture. Such architectures are modular, flexible, enterprise-wide, based on standards rather than specific vendor products, and owned by the customer, not the suppliers. This enables the IP infrastructure required for competitiveness and success in the new business environment.

Tapscott and Caston list ten technology themes that enable businesses to transform themselves

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into responsive, service-oriented, and profitable firms. These themes include open systems, distributed computing, interconnection, user friendliness, global networking, and architectural modularity. This last theme is described as follows:

> Rather than being a giant monolith, computing architectures consist of standardized, independent parts that can be grouped together as required to meet business requirements. These can include standard computing platforms, or interchangeable application software components. The goal is to create a dynamic, flexible computing environment...

The Open Blueprint is IBM's view of a modular architecture. Many IBM customers are using the Open Blueprint as a guide for creating their own internal architectures for deploying applications in the open, distributed environment. It will help IBM and others deliver integrated, interoperable solutions with the following benefits:

- **For end users**: Open Blueprint integration hides the complexities of the network and makes it appear as a single system.
- **For application developers**: Standard interfaces enable a single system view of the network and allow for the development of interoperable applications that can run on many platforms.
- **For system administrators**: The Open Blueprint defines a consistent way to manage the network to hide the complexities from application developers and end users.

References

The Tapscott and Caston book gives a complete look at how to re-invent, re-engineer, or re-architect your enterprise through the transition from host-centered, mainframe-based computing to user-centered, network-based computing. It makes the case for complete planning and for adopting an architecture such as the Open Blueprint that is based upon standards. Other valuable references include the following (see the box for ordering instructions):

- Hammer, Michael and Champy, James. *Re-engineering the Corporation*. Harper Collins, 1993.
- *IBM Networking Blueprint Executive Overview* (GC31-7057).
- *IBM SystemView® Concepts* (SC23-0578).
- *IBM SystemView Structure* (SC31-7038).
- *Information Warehouse™: An Introduction* (GC26-4876).
- *Multimedia Distributed Computing—IBM's Direction for Multimedia Distributed Systems* (G229-7340).
- *Open Blueprint Technical Overview* (GC23-3808, available 2H94).
- *The Networking Blueprint* (SX33-6090).
- X/Open Company Ltd. *Distributed Computing Services Framework*, November 1992 (ISBN 1-872630-64-2).