

# TMN-based Integrated Network Management Using Web and CORBA

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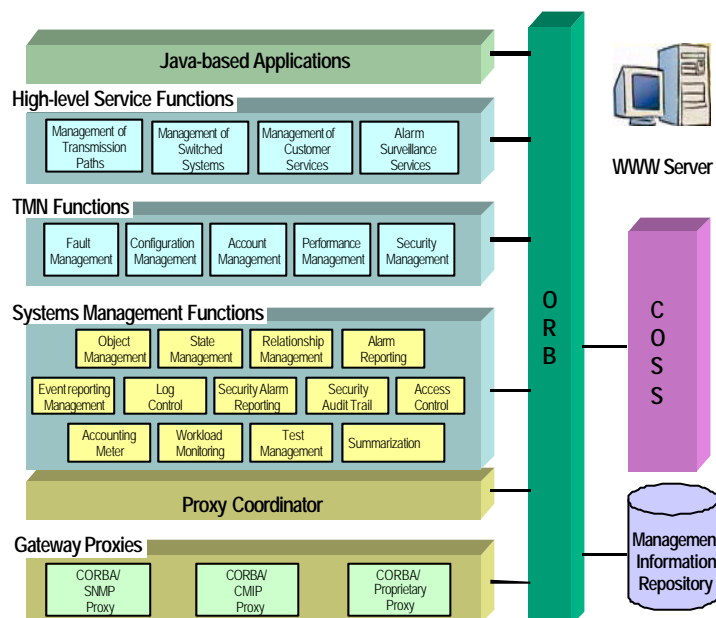
Recent growth in networking technologies has created much more complex and heterogeneous network environments. To manage network devices and services in such environments, various organizations have developed standard management platforms using different management protocols (e.g., SNMP, CMIP, TMN). For telecommunications network management, TMN has been chosen as an appropriate management framework for providing a systematic and consistent management solution. However, the TMN does not provide implementation details in its standard, making the realization of TMN-based management systems very difficult and time-consuming.

This paper proposes a TMN-based integrated network management system architecture using WWW and CORBA technologies. WWW technology enables human users to be free from complicated system interfaces and CORBA technology enables developers to create and add distributed management components easily. Our work focuses on developing a TMN-based manager system using CORBA and Web and attempts to achieve integration of SNMP/CMIP-based managed systems through gateways. Our management system architecture provides generalized TMN management interfaces on the protocol-oriented gateway systems. Using the generalized interfaces, the TMN management functionality can be easily added to provide complicated TMN management services to users via WWW browsers.

The proposed TMN-based network management system architecture is illustrated in Figure 1. The architecture includes the functional blocks such as gateway proxies, proxy coordinator, system management functions, TMN functions, high-level service functions, and Java-based management applications. Every module is designed as a CORBA component and interconnected to each other via ORB. On the right side of the figure, there are auxiliary facilities: managed object factory, Common Object Service Specifications (COSS), and WWW server. These are also accessible through the same ORB.

In order to validate our architecture, we have developed a Web and CORBA-based management system that provides an alarm surveillance service. Alarm

surveillance service is one of the sub-functions defined in the TMN fault management standard. The implemented alarm surveillance system consists of four modules: agent, gateway, manager, and management application. We have chosen SNMP-based managed systems as the target managed systems. We have developed a SNMP SMI/CORBA IDL translator as well as a CORBA/SNMP gateway using the JIDM Specification and Interaction Translation specifications. We have also developed the system management functions and alarm surveillance service using CORBA (IONA Orbix 2.3 & OrbixWeb 3.0). The alarm surveillance management application has been developed as a Java applet (JDK 1.1.6), which gets downloaded from a Web server to the Web browser that a network administrator uses.



**Figure 1:** Proposed TMN-based Integrated Management System Architecture

Various research groups and vendors are currently using CORBA for realizing TMN. We have used CORBA and Java to realize a Web-based TMN system to provide a network administrator with a user-friendly, easy-to-use, and integrated interface. It provides developers with a generalized implementation architecture on top of an abstraction layer, hiding all protocol-dependent details. The proposed architecture can be extended so that other TMN services can be built easily.

As a continuation of our current work, we are currently developing a GDMO/IDL translator and CORBA/CMIP gateway so that we can also manage CMIP-based network devices and systems. Our future work includes developing other high-level TMN service functions as well as the corresponding system management functions using CORBA.