

**Telecommunications Management Network:
A Novel Approach Towards its Architecture and Realisation
Through Object-Oriented Software Platforms**

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Abstract

The increasing sophistication of telecommunications infrastructures and, in particular, the introduction of broadband transmission and switching technologies together with advanced services that exhibit guaranteed Quality of Service characteristics, have necessitated the use of sophisticated management facilities. The Telecommunications Management Network (TMN) is being developed by the ITU-T as the framework to support the *open* management of telecommunications networks and services, exploiting the capabilities of emerging broadband technologies and harnessing their power. It projects a hierarchical distributed paradigm in which interactions are object-oriented (O-O) in information specifications terms. On the other hand, it is mainly a *communications* concept, and, as such, it does not address software realisation aspects. The TMN uses currently OSI Systems Management (OSI-SM) as its base technology.

The complexity of the combined OSI-SM/TMN architectural framework and the fact that non object-oriented approaches have been initially adopted for its realisation has resulted in doubts about its feasibility, implementability, performance and eventual deployment. This thesis proposes first a number of modifications and extensions to the TMN model and architecture. The modifications aim at the simplification of the overall framework and rely on the fact that this thesis shows that full scale OSI-SM/TMN technology is both feasible and performant. The extensions introduce distribution and discovery facilities through the OSI Directory and aim to support the TMN as a large scale distributed system.

The thesis subsequently shows that the inherent object-oriented aspects of the OSI-SM/TMN framework can be exploited through an object-oriented realisation model that hides protocol aspects, bears similarities to recently emerging O-O distributed systems frameworks and has good performance characteristics without requiring excessive computing resources. The environment in which these concepts were validated is known as OSIMIS (OSI Management Information Service) and can be used as a TMN *distributed O-O platform* that enables the rapid development and deployment of TMN systems. It predated similar products by some years and influenced a number of subsequent commercial developments.

Open Distributed Processing (ODP) has recently emerged as the theoretical framework for object-oriented distributed systems. The Object Management Group (OMG) Common Object Request Broker Architecture (CORBA) can be seen as its pragmatic counterpart. Since the appearance of CORBA, a lot of research has addressed its use in TMN environments, because of its generality, better distribution paradigm and potentially better performance. Despite the relevant efforts though, there is no complete solution as yet that retains the full OSI-SM expressive power. This thesis proposes a solution that will make possible the seamless replacement of the OSI SM and Directory with CORBA as the base technology for the TMN.

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