International Research Journal of Computer Science (IRJCS)
Issue 12, Volume 3 (December 2016)
ISSN: 2393-9842
www.irjcs.com

Network Management for Next Generation Networks

V.SURESH,
Lecturer, Dept. of Computers
K.B.N. College

Abstract-- Generally, current network management technologies follow two approaches: ITU-T's recommendations for Telecommunication Management Network (TMN) and IETF's Simple Network Management Protocol (SNMP) that favors IP networks. The applications based on these approaches are specifically targeted at a variety of independent networks including the standard Public Switched Telephone Network (PSTN), the Public Switched Data Network (PSDN), the Public Land Mobile Network (PLMN), and the Wireless Local Area Network (WLAN), etc., all of which will be integrated into a single IP-based infrastructure referred to as Next Generation Networks (NGN) in the near future. The services, network architectures and traffic pattern in NGN will dramatically differ from the current networks. The heterogeneity and complexity of NGN bring a number of challenges to its network management. In this paper, we first introduce the current network management approaches and describe some deficiencies of current solutions. Then, the network management challenges in NGN are presented and discussed. Finally, some emerging approaches towards network management in NGN are illustrated.

INTRODUCTION

For the network management of telecomm networks and IP networks, there have existed two widely-adopted approaches. The first one is derived from ITU M.3000 recommendation series building on open systems interconnection standards (OSI) and is known as Telecommunication Management Network (TMN). The second one is supported by IETF and based on Simple Network Management Protocol (SNMP), which has become the de facto standard in the management fields of IP networks. These two general approaches have thus adopted different standards and implementation methods, and are also designed for different network architectures. In the past decade, they have been well accommodated the management requirements coming from the separated networks, such as PSTN and PLMN known as traditional scenarios. Thus, network management of current networks infrastructures has inevitably to be partitioned into multiple domains and located in various networks layers because of the heterogeneity of vendor technologies, and the coupling nature of services and networks.

When the networks are evolving towards NGN, the scenario in the future would become more complex. A common core network is more likely to replace the current separate networks infrastructures for different services, such as PSTN dedicated for telephony voice. The carrying of all kinds of traffic, no matter it is voice, data, video or signaling would be possibly integrated onto one common platform. That would call for the corresponding network management systems. On the other hand, the NGN is also expected to offer ubiquitous services to NGN users, and host many innovative applications with high level intelligence. Consequently, a number of network management challenges would emerge and should be paid sufficient attention by NGN service providers and network operators.

CURRENT NETWORK MANAGEMENT

Networks in essence can be broadly classified as telecommunications networks and IP networks. Accordingly, current network management solutions have followed two general technical directions: ITU-T's Telecommunication Management Network (TMN) for telecommunications networks and IETF's Simple Network Management Protocol (SNMP) for IP networks. These two approaches adopt different standards, protocols and implementations. Despite of their specific design for telecommunications and IP networks, they have shown more or less deficiencies in practice, especially when coping with the evolving network technologies.

In this section, we briefly introduce and analyze these two approaches, and then compare them from several points of view.

1TMN APPROACH

The telecommunications management network (TMN) has been widely adopted to manage telecommunications networks, ranging from transportation backbones to access networks. The TMN provides a structured framework for enabling interconnectivity and communication across heterogeneous operating systems and telecommunications networks. The TMN is defined in ITU M.3000 recommendation series, which cover a set of standards including common management information protocol (CMIP), guideline for definition of managed objects (GDMO) and abstract syntax notation one (ASN.1). The TMN primarily contributes to network management in the following two aspects:

- *Multivendor operation and interconnectivity*
- *Hierarchy modeling and Definition of functionality*

In TMN, multivendor management is achieved via a standard Q interface, which mediates the communication between two TMN-conformant functional blocks. For example, the CORBA-based NML-EML interface between Element Management System (EMS) and Network Management System (NMS) is defined to facilitate multi-technology compatibility. Separate management domains belonging to different vendors can be integrated under a common platform at network layer by applying an adapted Q interface, e.g. Q3 interface to be applied between EMS and NMS. Theoretically, the interconnectivity across heterogeneous Operation Systems (OSs) and networks can thus be implemented.

In the framework of TMN, the following logical layers are defined:

- *Network Elements (NE)*
- *Element Management Layer (EML)*
- *Network-management Layer (NML)*
- *Service-management Layer (SML)*

Current IP networks are often managed via Simple Network Management Protocol (SNMP), which is pushed by IETF as a specification, initially presented for the Internet. So far, there have been several versions of SNMP. The common ones are SNMPv1 (described in RFC1157) and SNMPv2 (described in RFC 1441-52). The SNMP is an application layer protocol and uses User Datagram Protocol (UDP) to exchange management information between management entities. Basically, the SNMP-based application consists of two logical components: agent and manager. An agent often resides in the managed devices and has the Management Information Base (MIB) to store managed objects. While, a manager refers to an entity that is interacting with its managed agents, and it often resides in network management applications.

The messaging between manager and agent is implemented by a set of polling and responding operations, such as "GET_NEXT_REQUEST", "GET_RESPONSE", and "TRAP". Although SNMP is only a lightweight implementation for network management, additional standards were added in recent years, such as SNMPv3 and RMON in order to enhance its management functionalities, especially in security and performance.

TMN vs. SNMP

Currently, the network management systems for independent networks are separated from each other (shown in Fig. 1). The network management systems for PSDN, PSTN, PLMN and WLAN are provided independently in each network. In addition, the management functions and implementations are often isolated and vertically distributed in transport, switching and access networks. The choosing of appropriate network management technologies has to be considered in the specific context of managed networks. In general, SNMP approach is simple, cost-effective and open in standards. The simplicity and ease of implementation of SNMP is why it is the most popular protocol for managing networks. In contrast, the CMIP or CORBA based TMN approaches are initially proposed for the management of telecommunications networks, and concentrate on reliability and stability of networks. Because of the incurred complexity, it requires more resources to develop and run. Therefore, it is most suitable for some mission critical applications, such as the management of transportation backbones.

NEXT GENERATION NETWORKS

The NGN is regarded as a network that can provide independent access to applications and contents, and is able to support multiple services in its common core & access networks. The NGN is expected to integrate services offered by traditional networks and other innovative IP services into a single service platform.

In the ETSI's definition for NGN , it is described as a concept for defining and deploying networks which, due to their formal separation into different layers and planes, and the use of open interfaces, offers service providers and operators a platform which can evolve in a step- by- step manner to create, deploy and manage innovative services.

Although NGN will derive greatly from the current telecommunications networks and IP-based infrastructure, its control and management architecture is likely to be radically different from both, and will be anchored on a clean separation between a QoS-enabled transport/network domain and an object-oriented service/application domain, with a distributed processing environment. The pressure arising from deregulation, competition and rapid technology development together with the fresh vision of NGN would generate significant challenges in terms of operation, administration and maintenance of networks and services.

6. CONCLUSION

To date, the mainstream network management approaches have shown some deficiencies in coping with the heterogeneous, dynamic and scalable network environments. Current networks are evolving rapidly towards NGN, which has shown many new characteristics and is expected to support multiple IP-based services. A variety of challenges in NGN make current management approaches not applicable in the future. Some foreseeable challenges have been discussed in this paper, combined with the characteristics and services of NGN. Furthermore, promising evolutionary and revolutionary approaches were presented to illuminate emerging technical trends in the network management development of NGN.

7. REFERENCES

[1]. "Next Generation Networks", IEC.ORG tutorial H.M. Sigurdsson, S.E. Thorsteinsson, T.K. Stidsen, "Cost optimization methods in the design of next generation networks",
[2]. *Communications Magazine*, IEEE, Volume 42, Issue 9, Sept. 2004 pp.118-122 "Next Generation Networks and the Cisco Carrier Routing System",
[3]. Cisco Systems, Inc., White Paper "Telecommunications Management network IEC.ORG tutorial
[4]. Felix F.Flemisch, "Using CORBA for Multi-Technology Network Management (MTNM)", MTNM Phase III Modelling Team,

