Requirements for the Operations and Management of 4G Networks

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Abstract: The 4G network environment is envisioned to be an inter-working environment of heterogeneous networks of 2G, 3G, and 4G all interconnected through the service provider IP backbone networks and the Internet. The operations and management of such interconnected networks is expected much more difficult than the current environment. This paper examines the challenges and defines the requirements for operation and management of the 4G network environment.
Keywords: 4G Networks, Operations and Management, 4G Network Environment.

1. INTRODUCTION

As 3G networks undergo deployment and final standardization, attention is turning to the next generation of wireless networks. The 4G networks are expected to support a variety of personalized, multimedia applications such as multimedia conferencing, video phones, video/movie-on-demand, education-on-demand, streaming media, multimedia messaging, etc. Personalized services will be supported by personal mobility capability, which concentrates on the movement of users instead of users' terminals, and which involves the provision of personal communications and personalized operating environments.

Driven by the need to support context-rich multimedia services and applications, the fourth generation (4G) mobile communication systems are under development by researchers and vendors around the world [1-5]. With the advances in networking, multiplexing, scheduling and physical layer technologies, 4G systems are also expected to provide higher bandwidth to more users and thus provide more cost-effective services than 3G systems.

The 4G networks are expected to co-exist and inter-work with existing 2G and 3G mobile communication systems as well as satellite, wireless LAN (WLAN), and IEEE 802.16e (also known as Wireless MAN (WMAN) or WiMAX [6]), all interconnected through the service provider IP backbone networks and the Internet as illustrated in Figure 1. In this heterogeneous networks environment, in addition to the traditional challenges such as roaming, horizontal handoffs, security, quality of service (QoS) support, and charging, new challenges such as vertical handoffs, network choice selection, and global roaming exist and must be met with appropriate solutions.

Effective, secure and efficient operations and management of the envisioned 4G network environment is a huge challenge. Traditional network operations and management methods and protocols such as CMIP [7], TMN [8], SNMP [9], WBEM [10] themselves are not going to be sufficient enough to support such complex communication and service environment. New, intelligent, and self managing operations,