

# Chapter 10

## Vehicular Metropolitan Area Network Systems Architecture: The WiMAX Network Reference Model

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### ABSTRACT

*The WiMAX NWG develops a network reference model to serve as an architecture framework for WiMAX deployments and to ensure interoperability among various WiMAX equipment and operators. The network reference model envisions unified network architecture for supporting fixed, nomadic, and mobile deployments and is based on an IP service model. The authors introduce WiMAX network architecture, WiMAX network entry, mobility management, QoS functional elements, core network planning and accounting architecture in this section. However, all of them are significant in deploying WiMAX core network. The operator tries to reach the goals including system performance, reliability, and so on. On the other hand, the WiMAX operator should consider and balance such many variables in order to achieve a better situation.*

### INTRODUCTION

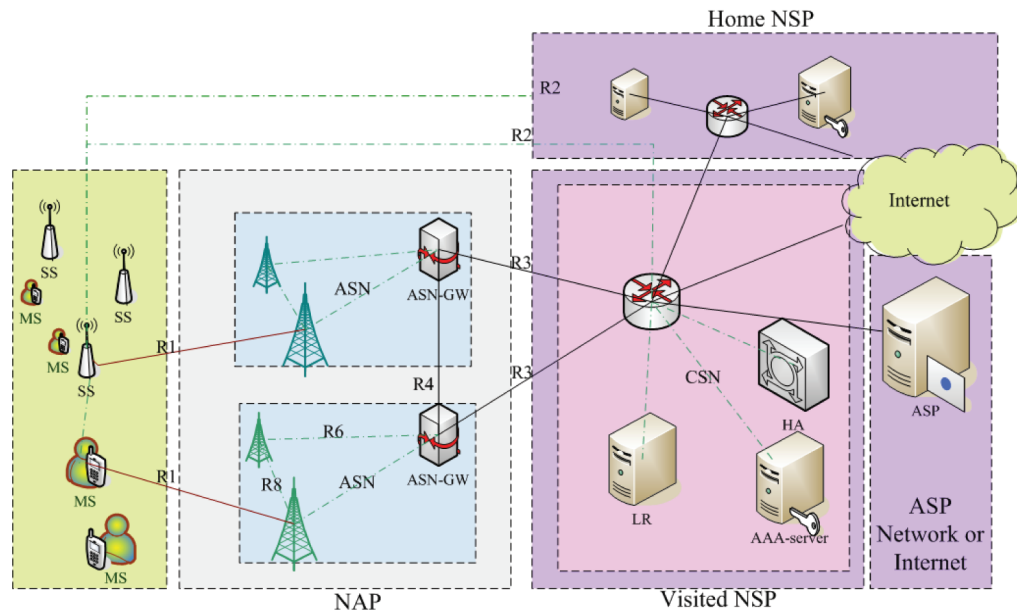
Based on WiMAX Forum Network Architecture definition (Stage 2: Architecture Tenets, Reference Model and Reference Points (Juo et al., 2008)) (Stage 3: Detailed Protocols and Procedures (WiChorus, 2009)), the WiMAX network reference model includes the logical functional entities and reference points. Figure 1 shows the WiMAX network reference model containing reference points, functional

entities, and some important basic elements like Network Service Provider (NSP) and Network Access Provider (NAP).

The functional entities contains Subscriber Station (SS)/Mobile station (MS), ASN (Access Service Network) and CSN (Connectivity Service Network). As in Fig 10.1, the network reference model depicts telecommunication's operations. Access Service Network is managed by NAP (Network Access Provider). CSN is managed by NSP (Network

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*Figure 1. WiMAX network reference model*



Service Provider). CSN provides IP connectivity, links out with the internet and combines with its Home-ASP (Application Service Provider). Basically, the overall architecture can be divided into three parts. The first part (left position in Figure 10.1) is MS/SS equipments, and it's also called the end users. The second part (center position in Figure 10.1) is ASN. ASN supports wireless communication and air-interface to MS/SS. The third part is CSN where inner management servers locate (such as Home Agent, Location Register, AAA server and so on).

Based on Figure 1, we give an introduction for these functional entities and reference points:

**ASN (Access Service Network):** It links with WiMAX Customer Premises Equipment (CPE) e.g. MS, SS. Access Service Network (ASN) functions support WiMAX Layer2 connectivity, AAA messages forwarding, WiMAX NSP selection, Layer-3 link tunneling (BS-SS) and Radio Resource Management (RRM). The operations can be seen in the ASN-GW function.

**ASN-GW (ASN Gateway):** As in Figure 2, we can observe the ASN-GW functions which

contain reference points and functional entities in ASN. ASN-GW not only manages IP Data Forwarding in ASN, but also links with the other function entities inside or outside the ASN-GW. It tunnels data and packets to the suitable BS. ASN-GW Control plane handles all of the radio-independent control and includes authorization, authentication, and accounting (AAA), context management, profile management, service flow authorization, paging, radio resource management, and handover. Data plane feature set includes mapping radio bearer to the IP network, packet inspection, tunneling, admission control, policing, QoS and data forwarding.

**ASP (Application Service Provider):** ASP provides basic network service and manages applications with IP-network. An application service provider (ASP) is a business that provides computer-based services to customers over a network. Software offered using an ASP model is also sometimes called On-demand software.

**CSN (Connectivity Service Network):** The CSN contains several functional elements and tasks for supporting IP-Network connectivity to

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