Mobility Management for Satellite / Terrestrial Multi-Service Convergence Networks

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Abstract— **Hybrid networks of terrestrial and satellite is seen to be the perfect choice of strategy to support the vision of total global. This will indeed fulfill the connectivity of "anytime", "anyplace" and "anyone". The ubiquitous solution were sought to fulfill this vision. However there was a challenge to integrate all existing technology into a single entity, especially the efficiency of the mobility management. This paper will discuss the different strategy in mobility management of terrestrial / satellite convergence network in order to attempt to explain the functionality and discuss the problems involved and proposed solution in order to create a more efficient seamless ubiquitous communication.**

Keywords - Mobility Management, Ubiquitious, Multi-Service Convergence, Handoff Decision

I. INTRODUCTION

The multi-service convergence network technology has become the logical choice of solution for truly global mobile communication solution with the connectivity of "anyone", "anytime" and "anyplace". The hybrid of mobile and satellite networks poses great challenge to the engineers to harmonized the different requirements of different system architecture and different services.

There has been a great debate on the justification for the integration of the satellite in the existing network lately. While the terrestrial mobile communication networks have been well established, of which the urban users has been greatly benefited, the consumers in the rural areas were still being deprived the opportunity of using these technologies. The construction of communication tower in these areas is uneconomical due to the sparsely distributed population, terrain and vegetation obstacles. Still, most of the world populations are living in rural, especially in Asia, (72 per cent), although there are trend of rural population moving towards the urban. [1] In this sense, satellite component is seen to be an excellent choice to support the already available terrestrial network backbone.

Many of the mobile technology today are adopting the hybrid of two or more different systems to provide larger coverage of their services. For example, the General Packet of Radio Services (GPRS), Enhanced Data rate of GSM Evolution (EDGE) and Universal Mobile Telecommunication System (UMTS) were designed so all systems hand-in-hand to provide wider range of coverage and services to the consumer. As the demand from the consumer for higher data rate with Quality of Service (QoS) guaranteed service becomes inevitable, a ubiquitous solution is being sought by many researchers today.

The issue of ubiquitous solution has been addressed in few international projects previously. For example, the Multi-segment System for Broadband Ubiquitous Access to Internet Services and Demonstrator (SUITED) project funded by the European Union under the IST Program had looked into the performance of hybrid networks especially in the heterogeneous environment. A multi-segment (satellite and land mobile) Global Mobile Broadband System (GMBS) was created and tested and produced a convincing results. [2] The ACT Satellite Integration into Networks for UMTS Services (SINUS) project on the other hand looked into the possibility of integrating Space-segment UMTS (S-UMTS) by creating series of test beds for testing and investigation. [3]

Several issues need to be addressed for heterogeneous network to work, especially when involving the space-terrestrial segments. The efficiency of Inter-Segment Handoff (or Handover) (ISHO) protocol was viewed as one of the most important issue to addressed in order to ensure seamless transition between segments. Traditional handoff protocol relied on single performance metric such as the Received Signal Strength (RSS) or Bit Error Rate (BER) for handoff decisions.[4-7] For instance, the Advance Mobile Phone Service (AMPS and the Total Access Communication System (TACS) handoff decisions were based on the RSS measured at the Base Transceiver Station (BTS). In Global System of Mobile Communication (GSM) however both mobile terminal and BTS provide inputs for decision making process where measurements of BER were taken apart from the RSS. [8] However, softer and indirect approach was explored recently for a better decision making for handoff, which will be discussed later in this paper.

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