A Survey on IEEE 802.16g Protocol Convergence between Terrestrial and Satellite Segments

Suriya M[1] , Vaishnavi J[2] , Sugandhanaa M[3] , Dhivya Bharathy P[4]
[1] *Assistant Professor, Department of Information Technology, SNS College of Engineering, Coimbatore, India*
[2,3,4] *B.Tech(Information Technology), SNS College of Engineering, Coimbatore, India*

Abstract

In this paper , the main role of IEEE 802.16G protocol convergence between terrestrial and satellite segments are highlighted, The IEEE 802.16 standard, first published in 2001,defines a means for wireless broadband access as a replacement for current cable and DSL "last mile" services to home and business. Handover is the mechanism that is used to transfer information from one terminal to another as a user moves through the coverage area of a cellular system. Here the network selection is the handover decision process between various network environments .This handover decision will be either mobile or network initiated. In this study we have a tendency to discuss the utilization of a cost function to perform associate a network selection exploitation information provided by these standards, such as network coverage or network properties. The efficient function provides flexibility to balance the various factors within the network selection, and our research is focused on rising each seamlessness and energy efficiency of the devices in handovers.

Keywords: *Handover, Hybrid Satellite, Terrestrial Networks, Protocol Convergence, IEEE 802.16g.*

I. INTRODUCTION

The IEEE 802.16 standards defines how wireless traffic move between subscribe equipment and core networks. The IEEE Standard 802.16 is a new standard when compared to existing standards. The 802.16 standard is commonly referred to as Wireless MAN because its goal is to implement a set of broadband wireless access standards for wireless metropolitan area networks.

The features of IEEE 802.16 are it uses microwave for the wireless transfer of data and specifies a frequency band in range between 2gHZ to 66gHZ.it also has the high speed wireless networking and effective in cost. It is easy for installing purpose. Leading to low installation cost, when compared to fiber, cable or DSL deployments.

A. Transformation of 802.16 Standard to 802.16g

The IEEE 802(16G) is effectively used in remote sensing with protocol management Techniques. This technique is used to increase the frequency band range when compared with the 802.16. It is defined in the original mobile specification, the handover process defines a "backbone" method for requesting mobile subscriber information. When the specification states that the base station may request MS information from a serving BS, this does not mean that a servings BS should provide it. A base station needs the ability to determine when it should refuse to provide MS information to a requesting BS. The handover description in 802.16 is high level and the 802.16g specifies what this request and response.

B. Support for Satellite Communication

The principal in satellite communication driving factor is to facilitate and then utilize different wireless communication systems to provide varied range of services to users in most efficient and seamless way, by considering signal quality, Handover, Traffic congestion conditions. The fundamental capabilities of satellite networks, for instance very large coverage areas, speed of implementation and inherent multicasting and broadcasting capabilities make them the prime choice to serve niche areas like coverage in planes, navy ships, hostile environments etc. Despite all these, satellite systems suffer from many drawbacks such as technological complexity, high costs, and deep fading at high frequencies. Telecommunication networks are making its progress and showing lights on systems that will work on different technologies such as 2g/3g, satellite. They are used for mobile applications such as communication to ships, vehicles, planes, hand-held terminals and for TV and radios.

II. LITERATURE REVIEW

A. IEEE 802.16e-Independent Information Service

There are currently various efforts underway in standard organizations and industry forums to standardize heterogeneous handovers, including IEEE 802.16e and 3G/4G networks (Houeto and Pierre,2007). In particular IEEE 802.16e fully compatible with the network services. The media independent handover

protocol defines frame formats for exchanging messages between peer IIS Function entities. These messages are based on the layers which are part of Independent Event service, Independent Command service and Independent Information service (Pentikousis, 2010; Buhler, 2010). Our work aid IIS. The Independent Information Service provides a data store of available networks and network parameters and defines the standard request/response messages to access and retrieve such information for each available access network. Such Information is critical for the handover process. For instance, the information of available networks is very useful for optimizing the network selection process.

B. Handover Scenario

A mobile subscriber (MS) moves around a network and expects to seamlessly maintain connectivity. When a mobile subscriber moves connectivity through one Base Station subscriber (BS) over to another, this is known as a subscriber handover (Liu et al., 2008). The handover in a wireless network are the focal point of this work. The accurate and predictive link later triggers to enable seamless handovers and minimize service interruption. It addresses how to detect link status changes and how to accurately predict such changes. The ability to predict link triggers accurately and earlier in time, especially the network line down and link down triggers, will send early warnings to entities such as connection managers and give it extra time to prepare for the handover and seamlessly transfer application sessions (LIU ET AL., 2008), hence further reduce the service interruption. The trigger scheme also includes a trigger prediction step. A link trigger is predicted based on predicted future received signal strength indication values using long and short history windows (Muscariello et al., 2001). Then a trend analysis algorithm is used to analyze the long and short term trends of received signal strength indication to prevent false predictions. Evaluation and implementation of the algorithm based on real devices.

C. Cost-Based Independent Service Handover

A policy-based network selection algorithm with a cost function is first introduced in (Abdelsalam and Olariu, 2011). In a handover network with the lowest cost is the network that would provide the most benefit to the user and is the optimal handover target. The increase in value or functionality within a cost-controlled environments is a far more useful than simply paring or lopping elements to a handover. In the survey the energy functions only consider the traditional network approach such as bandwidth, delay and power by 802.16e, we now have the ability to also consider the physical location of networks, network services, the services offered by these networks, security requirements.

III. SYSTEM ARCHITECTURE

A. IEEE 802.16g Network Selection

Defined in the original mobile specification, the handover process defines a “backbone” method for requesting mobile subscriber information. The IEEE 802.16g includes the network layer, so that it can be able to provide the mobile communication effectively. Also it is used for overcoming the issues like Signal quality(coverage), Handover, Traffic congestion conditions and cost issues. The figure1 proposes Control and Management SAPs for interfacing 802.16g to the control and management planes of the Network Control and Management Systems(NCMS) abstraction. The target is not to define SAPs on every protocol layer interface. The intent should rather be to define SAPs that can practically be used by upper layer protocols for exercising the air interface functionality at the same time allow for evolution of the air interface protocols.

The control and management SAP are used for mapping to NCMS protocols. These SAPs provide the minimal primitives 802.16g should also define MAC layer. The IEEE 802.16g Architectural Protocol includes the layers of PHY sublayer, MAC Common part sublayer, Service specific convergence sublayer in the control and data plane. The Management plane consists of layers like Management entity PHY sublayer, Management entity MAC common part sublayer, Management entity MAC common part sublayer, Management entity service specific convergence sublayer.

B. Control SAP

This SAP will define primitives for all the relevant MAC management messages that are control plane related. This includes security, handoff trigger etc.

C. Management SAP

This will define primitives for all the MAC management messages that are management plane related. These include channel measurements, setting and getting parameters for configuration and also statistics. The Management SAP has the layers of Management entity services that is specific to convergence sublayer.

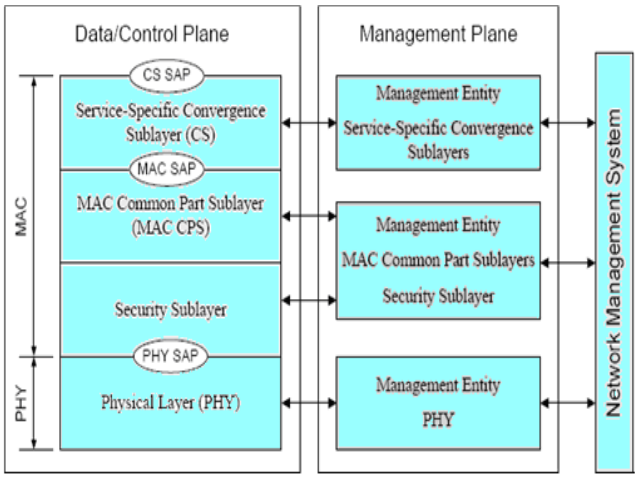

Fig 1: 802.16g Architectural Model

D. Network Control and Management System

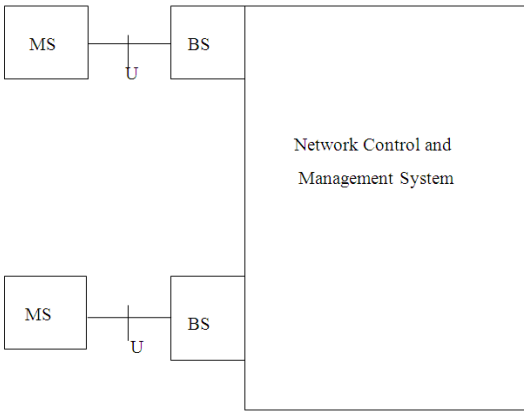

Fig 2: 802.16g Network Reference Model

NCMS protocols are not defined in this specification, however information elements and protocol primitives for these IEs are exposed using Service Access Points(SAP). This includes CS, MAC and PHY layer context information used by NCMS protocols to manage and control the air interface. Every BS is assumed to be part of an NCMS and therefore as shown in Fig 2.

IV. DISCUSSION ON PROTOCOL CONVERGENCE

In a converged network all routers "accept" on what the network topology looks like, convergence is an important idea for a set of routers that engage in dynamic routing. All interior Gateway Protocols rely on convergence to function properly. The IEEE 802(16G) is effectively used in remote sensing with protocol management Techniques. This technique is used to increase the frequency band range when compared with the 802.16. It is defined in the original mobile specification, the handover process defines a "backbone" method for requesting mobile subscriber information.

A. Problems in 802.16 Protocol Convergence

In wireless networks, confidentiality is a primary concern for secure transmission. Resistance to interruption and eavesdropping are other common threats. Message authentication is for integrity of the message and sender authentication, Availability guarantees that the services are not prevented from access by Dos attack, Anti-replay identifies and disrepute any message that is a repeat of a past message (Xu et al, 2006). So there are some security issues in the protocol convergence.

B. Terrestrial Satellite

The IEEE 802.16g is appears as the good candidate for handover management in future integrated satellite/ terrestrial system. The advantages of satellite communication over terrestrial communication are, The coverage area of a satellite greatly exceeds that of a terrestrial system. Transmission cost of a satellite is independent of the distance from the center of the coverage area. Satellite to satellite communication is very precise, higher bandwidths are available for use. Service types of satellite are, FSS(Fixed Service Satellite) the example of FSS is Point to Point communication. BSS(Broadcast Service Satellite)Example for BSS is Satellite Television/Radio. It is also called as Direct broadcast service(DBS). MSS(Mobile Service Satellite) example for MSS is Satellite phones. Satellite is becoming increasingly uneconomic for most trunk telephony route, but there are still good reasons to use satellite for telephony such as, thin routes, diversity, very long distance, traffic and remote locations. Land mobile /personal communications in urban areas of developed countries new terrestrial infrastructure is likely to dominate example GSM, etc but, Satellite can provide fill-in as terrestrial networks are implemented, also provide similar services in rural areas and underdeveloped countries. The IEEE 802.16g is used to provide the efficient mobile service in terrestrial areas. It has the higher bandwidth when compared to the 802.16. Despite all these, satellite system suffers from many drawbacks such as technological complexity, high cost, and deep fading at high frequencies. Fig 3 explains about the Satellite/Terrestrial Hybrid Networks.

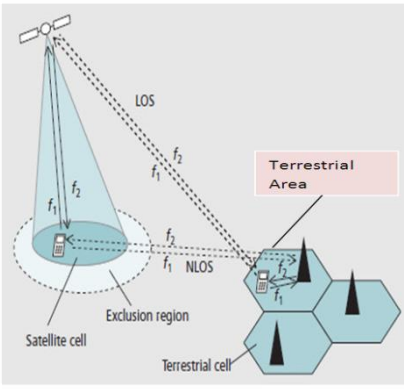

Fig 3:Satellite/Terrestrial Hybrid Networks

C. Applications of Terrestrial Satellite

The applications of terrestrial satellite are online mapping, GIS applications, remote sensing, land management, observation of natural disasters, probability modeling, damage management and also used in Military communication, Transportation, Civil engineering, Agriculture, Car Navigation. It provides efficient handover. The IEEE 802.16g has the ability to provide the efficient mobile service in the terrestrial areas using the 802.16g module.

V. CONCLUSION

Review of the main research activities which shows the Importance of independent information service to make the handover performance optimized in wireless devices. Here the survey has been made to analyze the features of 802.16g over 802.16e. When the number of frequencies on these devices increases and at the same time end-users expect a seamless connectivity across all frequencies especially in the terrestrial networks, so that the importance of protocol convergence for terrestrial satellite communication using 802.16g was optimized in this paper. And also the optimization of handover has been analyzed to provide the seamless handover operations.

Initially envisaged to support handover between different wireless 802.x network technologies. The IEEE 802.16g also appears as the good candidate for handover management in future integrated satellite/terrestrial systems. In particular, the satellite network can provide the best and most comprehensive coverage for low-density populations, while the terrestrial network or the ground component can provide the highest bandwidth and lowest cost coverage for high-density populations in urban environments.

REFERENCES

[1] AbdelSalam, H.S. and S. Olariu, 2011. Toward efficient task management in wireless sensor networks. IEEE Trans. Comput., 60: 1638-1651. DOI:10.1109/TC.2010.264

[2] Ahmavaara, K., H. Haverinen and R. Pichna, 2003.Interworking architecture between3gpp and wlansystems. IEEE Commun. Mag., 41: DOI:10.1109/MCOM.2003.1244926

[3] Baliosian, J. and R. Stadler, 2010. Distributed autoconfigurationof neighboring cell graphs in radioaccess networks. IEEE Trans. Netw. Ser. Mana., 7:145-157. DOI: 10.1109/TNSM.2010.1009.I9P0330

[4] Buhler, J. and G. Buhler, 2010. Traffic-awareoptimization of heterogeneous access management.IEEE Trans. Commun., 58: 1737-1747. DOI:10.1109/TCOMM.2010.06.090182

[5] Chen, J.C., T.C. Chen, T. Zhang, E. V.D. Berg, 2006.Effective AP selection and load balancing in IEEE802.11 wireless LANs. Proceeding of the IEEEGlobal Telecommunications Conference, Nov. 27-Dec. 1, IEEE Xplore Press, pp: 1-6. DOI: 10.1109/GLOCOM.2006.724

[6] Chuah, S.P., Z. Chen and Y.P. Tan, 2012. Energyefficientresource allocation and scheduling formulticast of scalable video over wireless networks.IEEE Trans. Multimedia, 14: 1324-1336. DOI:10.1109/TMM.2012.2193560

[7] De Couto, D.S.J., D. Aguayo, J. Bicket and . Morris,2003. A high-throughput path metric for multi-hopwireless routing. Proceedings of the 9th AnnualInternational Conference on Mobile Computing andNetworking, Sept. 14-19, ACM Press, New York,USA., pp: 134-146. DOI: 10.1145/938985.939000

[8] Fang, Z. and J. McNair, 2004. Optimizations for vertical handoff decision algorithms. Proceedings of the IEEE Wireless Communications and Networking Conference, Mar. 21-25, IEEE Xplore Press, pp:867-872. DOI: 10.1109/WCNC.2004.1311300

[9] Fang, Z. and J. McNair, 2006. Multiservice vertical handoff decision algorithms. Eur. J. Wireless Commun. Netw., 2006: 52-64. DOI: 10.1155/WCN/2006/25861

[10] Muscariello, L., M. Mellia, M. Meo, R. Lo Cigno, M.Ajmone Marsan, 2001. A simple markovianapproach to model internet traffic at edge routers.Dipartimento di Elettronica

[11] ETSI TS 102 464 V1.1.1, "Satellite Earth Stations andSystems (SES); Broadband Satellite Multimedia (BSM);Interworking with DiffServ QoS", January 2007.

[12] ETSI TR 102 442-1 v1.1.1, "Satellite Earth Stations andSystems (SES); Satellite component of UMTS/IMT-2000;Multimedia Broadcast/Multicast Services; Part 1: Services Definition", November 2006.

[13] A. Jahn, and all, "Aeronautical Communications forPersonal and Multimedia Services via Satellite", 21stInternational Communications Satellite Systems Conference & Exhibit, Yokohama, Japan, 15-19 April 2003.

[14] S. Scalise, V. Schena, F. Ceprani, "Multimedia ServiceProvision On-Board High Speed Train: Demonstration andValidation of the Satellite-Based FIFTH Solution", 22nd International Communications Satellite Systems Conference& Exhibit, Monterey, California 9-12 May 2004.

[15] H. Skinnemoen, S. K. Hansen, A. Jahn, M. Berioli, "Satellite Based Infrastructure for Emergency Communications"