Abstract

Emerging standardization of Geo Mobile Radio (GMR-1) for space segment technology like satellite system is having strong resemblance to terrestrial GSM (Global System for Mobile communications) at the upper protocol layers of OSI and TCP (Transmission Control Protocol) is one of them. This space segment technology as well as terrestrial technology, is characterized by periodic variations in communication properties and coverage, causing the termination of ongoing call as connections of Mobile Nodes (MN) alter stochastically. Although provisions are made to provide efficient communication infrastructure this hybrid space and terrestrial networks must ensure the end-to-end network performance so that MN can move seamlessly among these networks. However from connectivity point of view current TCP performance has not been engineered for mobility events in multi-radio MN, when a sudden change in connectivity, due to handover, occurs. While there are protocols to maintain the connection continuity on mobility events, such as Mobile IP (MIP) and Host Identity Protocol (HIP), TCP performance engineering had less attention. TCP is implemented as a separate component in an operating system, and is therefore often unaware of the mobility events or the nature of multi-radios’ communication. This paper aims to improve TCP communication performance in Mobile satellite and terrestrial networks.
References

- Bhasin K. and Hayden J. L., "Space Internet Architectures and Technologies for NASA enterprises," International Journal of Satellite Communications, Special Issue: Communications for Space Missions, Volume 20, Issue 5, pages 311–332, September/October 2002
- Leung K., Shell D., Ivancic W., Stewart D. H., Bell T. L., and Kachmar B., "Application of mobile-IP to Space and Aeronautical Networks," IEEE Proceedings of Aerospace Conference, Big Sky, MT, USA, Vol. 2, pp. 1027-1033, 10-17 March, 2001, doi: 10.1109/AERO.2001.931283
- Falk A., Jasapara N., "Can a Satellite be an Internet router?" Available at: http://scholar.google.com/scholar?q=Can+a+Satellite+be+an+Internet+router&btnG=&hl=en&as_sdt=0%2C5
- Luglio M., Roseti C., Savone G., Zampognaro F., "Cross-Layer Architecture for a Satellite-Wi-Fi Efficient Handover," IEEE Transactions on Vehicular Technology, Vol. 58, No. 6 pp. 2990-3001, July, 2009, doi: 10.1109/TVT.2008.2011274.
- Wang R., Wu X., Zhang Q., Taleb T., Zhang Z. and Hou J., "Experimental Evaluation of TCP based DTN for Cislunar Communication in Presence of Long Link Disruption," Special Issue on opportunistic and delay tolerant networks of EURASIP Journal on Wireless Communications and Networking, Vol. 2011, January, 2011, pp. 1-11, Article No. 8. Doi: 10.1155/2011/720671.
- Dubois E., Fasson J., Donny C. and Chaput E., "Enhancing TCP based Communication in Mobile satellite Scenarios: TCP PEPs Issues and Solutions," 5th Advanced Satellite Multimedia Systems Conference and the 11th Signal Processing for Space Communications Workshop (ASMA/SPSC 2010), Sept. 13-15, 2010. Cagliari, Italy
- Giambene G., Marchi S., and Kota S., "TCP Performance Issues in Satellite and Wi-Fi Hybrid Networks for High-Speed Trains," ICST Transactions on Ubiquitous Environments, Jan-Mar, 2012, Vol. 12, Issue 1-3, pp. 1-12.
- Kim H., Lee S., "Improving TCP Performance for Vertical Handover in Heterogeneous Wireless Networks," International Journal of Communication Systems, Vol. 22, Issue 8, pp. 1001-1021, August, 2009
- Li Y. T., Leith D., Shorten R. N., "Experimental Evaluation of TCP Protocols for High-Speed Networks," IEEE/ACM Transactions on Networking, Vol. 15, No. 5, pp. 1109-1122, October, 2007.
- Del Re E., Fantacci R. and Giambene G., "Efficient Dynamic Channel Allocation Techniques with Handover Queuing for mobile Satellite Networks," IEEE Journal on selected Areas in Communications, Vol. 13, No 2, pp. -397-405, February, 1995.
- Boukhatem L., Gaiti D. and Pujolle G., "A time-based reservation scheme for managing handovers in satellite system," International Journal of Network Management, Vol. 13, No 2, pp. 139-145, March/April 2003, doi>10.1002/nem.467.
- Allman M., Glover D. and Sanchez L., "Enhancing TCP over Satellite Channel using Standard Mechanisms," RFC 2488 (Best Current practice), January, 1999. Available at: http://tools.ietf.org/html/rfc2488
- Vidales P., Patanapongpibul L., Mapp G. and Hopper A., "Experiences with
Heterogeneous Wireless Networks, Unveiling the Challenges; Available at: http://www.cl.cam.ac.uk/research/dtg/publications/public/pav25/HetNets04-Vidales.pdf
- "TCP auto-tuning zoo"; Available at: http://www.csm.ornl.gov/~dunigan/net100/auto.html
- Gurtov A., Passoja M., Aalto O. and Raitola M., "Multi-Layer Protocol Tracing in a GPRS Network"; Available at: http://www.cs.helsinki.fi/u/gurtov/papers/vtc02.pdf
- Leo M. and Luglio M., "Intersegment Handover between Terrestrial and Satellite Segments: Analysis and Performance Evaluation Through Simulation," IEEE Transactions on Vehicular Technology, Vol. 50, No. 3, pp. 750-766, May, 2001, doi: 10.1109/25.933310.
- Luglio M., Roseti C., Savone G., and Zampognaro F., "Cross-layer Architecture for a Satellite-Wi-Fi efficient Handover"; IEEE Transaction on Vehicular Technology, Vol. 58, No. 6, July, 2009, pp. 2990-3001.
- (157488-US-NP) Status: Patent - PAT, Title: A MOBILE NODE, A METHOD OR HANNOVER AND A COMPUTER PROGRAM (IPR Title: End Device Controlled Proactive TCP mechanism for Inter-system Handover). Inventor: Preetida Vinayakray-Jani, Pasi Sarolahti.
- Kim H., Lee S., "Improving TCP Performance for Vertical Handover in Heterogeneous Wireless Network"; International Journal of Communication Systems, Vol. 22, Issue 8, August, 2009, pp. 1001-1021.
- Wang R, Gutha B. and Rapet P., "Window-based and Rate-based Transmission Control Protocol Mechanisms over Space-Internet Links"; IEEE Transaction on Aerospace and Electronics Systems, Vol. 44, No 5, 2007, pp. 1109-1122.
- Das S., Das S., Bandyopadhyay B. and Sanyal S., "Steganography and Steganalysis: Different Approaches"; International Journal of Computers, Information Technology and Engineering (IJCITAE), Vol. 2, No 1, June 2008, Serial Publications.

Index Terms

Computer Science
Wireless Communications

Keywords

Satellite-terrestrial Networks  Tcp  Inter-system Handover