ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 4, Issue 12, December 2016

Survey on Bandwidth Aggregation for Mobile Devices using Multipath Video Transport in Wireless Networks

Kishori Shenokar, Rajeshwari Goudar

M. E Student, MIT Academy of Engineering, Alandi, Pune, India

Department of Computer Engineering, MIT Academy of Engineering, Alandi, Pune, India

ABSTRACT: the advancements of technologies in wireless infrastructure frameworks facilitate the mobile users for simultaneous video transmission to hand-held gadget. Next generation wireless communication systems are featured through heterogeneity where multiple wireless technologies are present jointly. Still, multipath video transport protocol above the resource-limited wireless network is challenged in multipath conventional protocols, remote systems are inaccuracy level and bandwidth-demanding. This survey paper provides the improvements of bandwidth aggregation during multi path video transmission for getting the bandwidth aggregation. Also multiple transport protocol for video quality is highlighted.

KEYWORDS: Bandwidth aggregation; multipath transport protocol; real-time video; wireless networks

I. INTRODUCTION

The massive development in wireless infrastructures and handheld gadgets facilitate mobile users to get multimedia contents with widespread access preferences, for example cellular networks, wireless remote area networks such as 802.11 family and internet wireless access networks are LTE, WiMAX [1]. Supported by the latest achievement in transmission technologies, mobile terminals are prepared with multiple radio interfaces to receive video through concurrent wireless networks. With the occurrence of such multihomed mobile workstations, the upcoming wireless environment is probable to integrate multiple access options to providing highquality mobile services. Resource confinements of absolute remote networks prompt that connection that is bandwidth joining about heterogeneous entrance medium for simultaneous attribute transmission. That state-of-the-symbolization versatile terminal for example the Samsung S5 smart phones and Mushroom products are set with diverse radio interfaces to concurrently accept data through several wireless access networks. Especially, an effective transport-layer protocol is capable to assurance the application-layer quality of service and optimizes the utilization of networks. Moreover, only transport protocols require the alteration at communication terminals. So by using several edges simultaneously, we can improve quality and provide support for applications requiring high bandwidth [13]. Further delay can be decreased when alternate path of communications are kept alive enhancing the reliability of video. Heterogeneous Wireless Network (HWN is a wireless communication network somewhere Internet services can be accessed through multiple wireless technologies
Like WiFi, WiMAX, GSM etc. Nowadays many of the Internet applications are demanding high bandwidth. The bandwidth of an entity technology is not sufficient to gather the current demand. The advantages of bandwidth aggregation are: Increased throughput: Many internet applications like video streaming services (example: YouTube, teleconferencing, online gaming etc) demand high bandwidth. The bandwidth of existing individual technologies is inadequate to support throughput demanding video applications. Hence bandwidth aggregation provides the increased transmission throughput to get together the requirement. Resource sharing: A multimode device can use multiple wireless technologies concurrently to provide higher bandwidth. Thus bandwidth aggregation increases resource sharing by combination of the limited channel resources. Reliability: Attaining bandwidth aggregation through

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 4, Issue 12, December 2016

simultaneous multipath transfer of video provides greater reliability. Multiple paths or channels are available for the transmission. At any instance, if any path fails, then there is availability of further path for the transmission. Thus bandwidth aggregation can bring in increase in reliability of communication system. The aggregated bandwidth can bring in significant benefits like increased throughput, resource sharing and increased reliability.

A. BANDWIDTH AGGREGATION APPROACHES

Bandwidth aggregation approaches are classified as dynamic or static depending on their adaptivity to network traffic as shown in Fig Dynamic Configuration / Adaptive approach: The bandwidth aggregation approach in which the varying network traffic characteristics are considered are known to be dynamic configurations or adaptive approach [4]. The network traffic is characterized by available bandwidth, delay and path loss rate. These are considered periodically for making scheduling decision of packets. Adaptive bandwidth aggregation approach have better performance gains over Non-adaptive bandwidth aggregation as changes in network traffic are considered and dynamic configuration of interface selection is carried out.
Static Configuration / Non adaptive approach: The bandwidth aggregation approaches in which the network dynamics

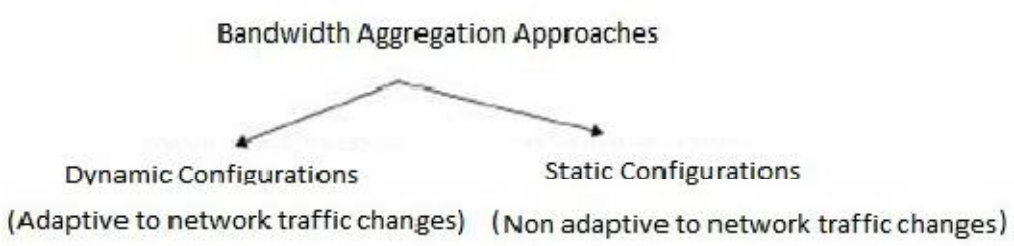

Fig. 1. Classification of Bandwidth Approaches

Fig. 2. Packet Reordeing

Are not considered and assume non-varying network traffic is known to be static configuration approach or non adaptive approach. The scheduling decision of packets is done based on static load balancing and does not take into consideration about network traffic conditions. Implementation of such approaches is easier and contributes for increased throughput, resource
Sharing and reliability. But performance depends on network traffic conditions. However, for attaining the bandwidth aggregation, there are some challenges to overcome such as: Packet reordering: This is caused due to simultaneous transmission of packets across concurrent multi paths. Each of the paths has different end-to-end delays and

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 4, Issue 12, December 2016

transmission speed. This causes receiving of packets as out of expected order. The packet reordering affects adversely on performance of any real time application. When the order of the packets received by the receiver is not same as the order of the packets sent by the sender then packet reordering has to be carried
Out [8]. It means the sequence number of the packet which is receiving is less than the sequence number of the packet that has already received as illustrated in Fig 1. That is packet no 3 is received before the receiving packet no 2. Similarly packet no 5 is received before packet no 4. Out of order packets need to be reordered. Delay: The end-to-end delay is increased due to the time consumed in reordering of the packets. Due to this delay, some of the packets of real time applications miss their corresponding deadlines and get discarded. Packet reordering and the delay caused by it can also affect the Transmission Control Protocol (TCP). TCP allows reordering of packets by maximum of two positions of reordering and corrects by inbuilt re-sequencing mechanism. However beyond two positions of reordering is regarded as packet loss and thus reducing the transmission window size. Consequently the application throughput may drop rapidly leading to the under utilization of accumulated bandwidth capacity. This affects a lot to the video streaming applications that have stringent quality of service (QoS) requirements. Thus for an efficient bandwidth aggregation, it is a must to incorporate the mechanism for packet reordering and minimizing the delay caused due to it. More battery power consumption: Battery power consumption is always a key issue with handheld devices. More amount of power is consumed by handheld devices during its operation as well as at idle periods. The battery power consumption is increased more when a terminal is equipped with multiple wireless interfaces. The operational lifetime of terminal is reduced leading to the risk of premature transmission termination. For ensuring uninterrupted concurrent multipath transfer of data, it is a must to incorporate a mechanism for minimizing the terminals battery power consumption.

B. STREAM CONTROL TRANSMISSION PROTOCOL (SCTP)

It is an end-to-end, connection-oriented transport protocol so as to transports information for autonomous sequenced streams. Those indicating transport (SIGTRAN) gathering of the web building team (IETF) characterizes SCTP norms for RFC 2960. Transport layer protocol which works once highest priority on a questionable connectionless system layer for example, IP. SCTP Might be executed clinched at the side of manage frameworks for more requisitions that convey data. Furthermore help personal satisfaction ongoing benefits of multimedia as:
1) Support multiple streams: Multiple streams per association, solves Head of blocking problem and enables incomplete ordering.
2) Support for multi-homed hosts: Multiple IP addresses per host, more tolerant to network failures.
3) Message-oriented: conserves message boundaries.
4) Unordered delivery: Stream Control Protocol can send message as ordered or unordered.
5) Congestion Control: SCTP congestion control is related to TCP, Enables seamless introduction of SCTP into IP networks.
6) SCTP is rate adaptive like to TCP.

C. MULTIPATH TRANSMISSION CONTROL PROTOCOL (MPTCP)

An IETF working bunch need as have late been made will define a multipath protocol for transport layer. The objective is to allow a single tcp connection to use multiple paths by increasing resource uasage and redundancy. They recommend MPTCP (Multipath TCP) and development for TCP/IP with handle various ways the middle of two endpoints. MPTCP will be planned in light of real three goals:
i) Enhance throughput: the execution of a multipath stream ought to further reinforcing in any event likewise beneficial. Similarly as this of a single way stream on the best course.
ii) Do no harm: a multi-path stream ought not to consume. At whatever that's only the incline of the iceberg limit once any a standout amongst its ways over a single way stream utilizing that course.
iii) Balance congestion: a multi-path flow should move away from the most congested paths as much traffic as possible. The presented multipath transport protocols are unsuccessful to transport real-time video in an energy-proficient and consistent manner.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 4, Issue 12, December 2016

II. RELATED WORK

Jiyan Wu, ET at. [1] Have presents an Energy-Video aware multIpath tranSport protocol (EVIS). First, there is a mathematical structure for delay-constrained multihomed video communication to examine the frame-level vitality quality tradeoff over various communication paths. Second, they build up scheduling algorithms for prioritized frame scheduling and unequal loss protection to attain target video quality with minimum use of device energy. EVIS is capable to efficiently control video frame priority and rateless Raptor coding to jointly optimize energy effectiveness and observed quality. Oh Chan Kwon et al. [2] has presents an Energy-efficient Multimedia Streaming Transport Protocol over multiple wireless networks. This energy-efficient multipath transport protocol is to carry a flawless high-quality video streaming service over multiple wireless networks. This protocol utilizes raptor codes as an FEC method to develop video quality shortage and head of line blocking problem found by wireless channel errors and the diverse uniqueness of wireless networks. These protocol forms the video flow and in view of the power consumption on-the-fly raptor decoding to keep receiver power whereas the raptor encoding parameters are find out. This protocol gets superb energy efficiency. This protocol utilizes the throughput-energy tradeoff designed for the path collection and blocking control. Jiyan Wu and Yuen et al. [3] have presents a Bandwidthefficient multipath streaming (BEMA) protocol. This protocol is marked by the priority-aware data scheduling and forward error correction based on consistent communication. This protocol is enlarged to increase the performance of data communication and utilization of networks. Author proposes a protocol is to facilitate quality-guaranteed immediate video gushing over multiple wireless networks. They also develop a joint raptor coding and data distribution framework to get video quality with least use of bandwidth. BEMA protocol is capable to efficiently ease packet rearranging and path asymmetric to network consumption.

Singh et al. [4] presents a multipath real-time transport (MPRTP) protocol. This protocol extends real-time transmission protocol (RTP) to multipath message development. However, it does not offer consistent data transfer aligned with channels losses. The implementation of this protocol shows that it is secure to install and facilitate load allocation and ability aggregation in different situation. MPRTP may support well in collecting various wireless networks for vehicular internet access. This protocol differentiates the communication paths through the congestion level and the allocation of bandwidth to delay. Tianjiao Liu et al. [5] has presents a novel Quality-aware

Adaptive concurrent multipath transfer (CMT-QA) scheme. This scheme uses SCTP for FTP similar to data communication and concurrent video release in multiple wireless networks. This method examines and analyses frequently all paths data handling ability and creates data delivery correction decisions to choose the qualified paths for parallel data transfer. CMTQA includes a series of devices to allocate data chunks over several paths intensely and control the data transfer rate of each path individually. The objective is to diminish the out-of-order data response by redundant fast retransmissions and decreasing the altering delay. It can efficiently distinguish between special forms of packet loss to avoid difficult congestion window modification for retransmissions. CMT-QA outperforms offered solutions in terms of quality and performance of service. S. Han et al. [6] have presents an effective end-to-end multipath transmission system to enable steady exist video gushing over multiple wireless networks stand on fountain code. Author also proposes packetization-aware fountain code to incorporate several physical paths well and raise the fountain decoding possibility over wireless packet switching networks. They presents a straightforward but useful physical path selection algorithm to make best use of the efficient video programming rate although fulfilling delay and fountain decoding failure rate constraints. This system is fully executed in software and observed over existent Wireless local area networks and High Speed Downlink Packet Access networks. Here mapping algorithm can maintain superior video quality than the predictable random mapping algorithm over wireless networks. The entire system is implemented using java and C/C++. Jiyan Wu et al. [7] have presents content aware concurrent multipath transfer (CMT-CA) system that executes priorityaware chunk development in SCTP to recover the streaming quality. This scheme is capable to recognize the priority and dependency of input video data and by decreasing the loss probability of more significant frames gets higher good-put. CMT-CA is developing to improve the observed video feature and utilization of network. Ismail et al. [9] have presents an energy and content aware multi-homing video transmission format to combines the energy control of mobile terminals (MTs) and quality of service constraint of video gushing applications. In proposed agenda, the MT find out the transmission control for the utilized radio edges, falls the some packets under the power constraint, and allocates the valuable packets to dissimilar radio interfaces in order to reduce

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 4, Issue 12, December 2016

video quality alteration. Author proposes a greedy approach (GA) for implementation in MTs to achieve power distribution and packet scheduling. First this approach is to improve the allocated power for each radio interface for available bandwidth, and MT battery energy constraint. Second this approach executes video packet scheduling to special interfaces so to decrease video quality alteration.

III. CONCLUSION

Mobile video traffic to hand-held gadgets has become a major driving force for video transmission wireless networks. In this Paper, we have studied different multipath transport protocol and scheme for video quality-guaranteed in wireless network. Bandwidth aggregation services can bring in significant improvements in performance over conventional single interface use by providing increased throughput, resource sharing and reliability. To maintain the quality for wireless mobile devices with least amount of energy consumption. Therefore, energy video alert multipath transport protocol is implemented to improve video quality. In future, various access networks would be the convergent of the wireless communication networks, integrating various transmission features and abilities.

REFERENCES

[1] J. Wu, C. Yuen, B. Cheng, M. Wang and J. Chen, Energy-Minimized Multipath Video Transport to Mobile Devices in Heterogeneous Wireless Networks, in IEEE Journal on Selected Areas in Communications, vol.34, no. 5, pp. 1160-1178, May 2016.
[2] O. C. Kwon, Y. Go and H. Song, An Energy-efficient Multimedia Streaming Transport Protocol over Heterogeneous Wireless Networks, in IEEE Transactions on Vehicular Technology, vol. 65, no. 8, pp. 6518- 6531, Aug. 2016.
[3] J. Wu, C. Yuen, B. Cheng, Y. Yang, M. Wang and J. Chen, Bandwidth- Efficient Multipath Transport Protocol for Quality-Guaranteed Real-Time Video Over Heterogeneous Wireless Networks, in IEEE Transactions on Communications, vol. 64, no. 6, pp. 2477-2493, June 2016.
[4] V. Singh, S. Ahsan, J. Ott, MPRTP: multipath considerations for real time media, in Proc. of ACM Multimedia Systems, 2013
[5] C. Xu, T. Liu, J. Guan, H. Zhang and G.M. Mutean, CMT-QA: Quality- Aware Adaptive Concurrent Multipath Data Transfer in Heterogeneous Wireless Networks, in IEEE Transactions on Mobile Computing, vol. 12, no. 11, pp. 2193-2205, Nov. 2013.
[6] S. Han, H. Joo, D. Lee, and H, Song, An End-to-End Virtual Path Construction System for Stable Live Video Streaming over Heterogeneous Wireless Networks, in IEEE Journal on Selected Areas in Communications, vol. 29, no. 5, pp. 1032-1041, May 2011.
[7] J. Wu, C. Yuen, M. Wang and J. Chen, Content-Aware Concurrent Multipath Transfer for High-Definition Video Streaming over Heterogeneous Wireless Networks, in IEEE Transactions on Parallel and Distributed Systems, vol. 27, no. 3, pp. 710-723, March 1 2016.
[8] Suhaimi A. Latif, Mosharrof H. Masud, Farhat Anwar and Md. Khorshed Alam, An Investigation of Scheduling and Packet Reordering Algorithms for Bandwidth Aggregation in Heterogeneous Wireless Networks, Middle-East Journal of Scientific Research 2013.
[9] J. Wu, B. Cheng and M. Wang, Energy Minimization for Quality- Constrained Video with Multipath TCP over Heterogeneous Wireless Networks, 2016 IEEE 36th International Conference on Distributed Computing Systems (ICDCS), Nara 2016, pp. 487-496.
[10] D. H. Bui et al. GreenBag: Energy-efficient Bandwidth Aggregation for Real-time Streaming in Heterogeneous Mobile Wireless Networks, 2013 IEEE 34th Real-Time Systems Symposium, BC, 2013, pp. 57-67.
[11] J. Wu, C. Yuen, B. Cheng, M. Wang and J. Chen, Streaming High- Quality Mobile Video with Multipath TCP in Heterogeneous Wireless Networks, in IEEE Transactions on Mobile Computing, vol. 15, no. 9, pp.2345-2361, Sept. 1 2016.
[12] J. Wu, B. Cheng, C. Yuen, Y. Shang and J. Chen, Distortion-Aware Concurrent Multipath Transfer for Mobile Video Streaming in Heterogeneous Wireless Networks, in IEEE Transactions on Mobile Computing, vol. 14, no. 4, April 2015.
[13] Kameswari Chebrolu, Bhaskaran Raman, Ramesh R. Rao. A Network Layer Approach to Enable TCP over Multiple Interfaces, Networks Journal, Volume 11 Issue 5, September 2005, pp.637-650.
[14] Kim J-O, Ueda T, Obana S. MAC-level measurement based traffic distribution over IEEE 802.11 multi-radio networks., IEEE Transactions on Consumer Electronics 2008;54(3):118591.
[15] A. A. Khalek, C. Caramanis, R. W. Heath, Delay-constrained video transmission: Quality-driven resource allocation and scheduling, IEEE J. Sel. Topics Signal Process., vol. 9, no. 1, pp. 60-75, 2015.
[16] Y. C. Chen, Y. Lim, R. J. Gibbens, E. M. Nahum, R. Khalili, D. Towsley, A Measurement-based Study of Multipath TCP Performance over Wireless Networks, in Proc. of ACM IMC, 2013.
[17] J. Wu, C. Yuen, B. Cheng, Y. Shang, J. Chen, Goodput-Aware Load Distribution for Real-time Traffic over Multipath Networks, in IEEE Transactions on . Parallel Distributed Systems, vol. 26, no. 8, pp. 2286- 2299, 2015.