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A Survey on Goodput aware Multipath Video Traffic over Wireless Networks

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ABSTRACT: The advancements of technologies in wireless infrastructures frameworks facilitate the mobile users for simultaneous video transmission to hand-held portable gadgets. Load sharing is a problem in arranging the incomplete network resources available to support traffic transmissions. Mounting an operational solution is critical for improving traffic performance and utilization of network. Due to path variety and irregularity in multiple networks, huge end-to-end delay and packet losses can significantly reduce the traffic flow goodput, but current studies mostly emphasis on the delay and throughput performance. This survey paper provides the various multipath protocols and system which required the improvements of goodput, video PSNR performance during multi-path video transmission.

KEYWORDS: Goodput, Multipath Protocol, Video Traffic, Heterogeneous Wireless Networks.

I. INTRODUCTION

The massive development in wireless infrastructures and handheld devices allow mobile users to get multimedia contents with universal access routes, for example cellular networks, wireless remote area networks. The network heterogeneity and high degree connectivity to various access medium deliver increased chances to found multiple paths between end devices [6]. Though, a single communication path is not proficient of completely filling the stringent quality of service requirements such as delay, bandwidth and reliability executed by existing and emerging real-time multimedia applications [10]. With the rise of multihomed or multi network clients, new research trends have motivated towards concurrently using these multiple paths for improved transmission reliability and throughput [4]. Supported by the latest achievement in transmission technologies, mobile terminals are prepared with multiple radio interfaces to receive video through concurrent wireless networks. The prevalence of such multihomed mobile workstations, the upcoming wireless environment is probable to incorporates multiple access options to providing high-quality mobile services. 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. The significant research issue in exploiting the available paths between multihomed communication terminals is to efficiently allocate input traffic load for providing sufficient QoS perceived by end users [9]. Certainly, ineffective load sharing can significantly reduce the traffic performance and network utilization such as load inequality, packet reordering, large end-to-end delay, etc. However, these network-level criteria cannot accurately show the benefits of upper-layer applications. Furthermore, the increased throughput may lead to larger end-to-end delays, which in turn prompt video quality degradation. Goodput differs from throughput as it represents the amount of data successfully received by the destination within the imposed deadline [11]. Multi-path transport has to deliver benefits from bandwidth aggregation to increased robustness. Although many devices support multi-homing, the most prominent transport protocol is TCP, but it only supports single-path transmission. The MPTCP extension enhances multipath transmission to TCP. MPTCP uses a single standard TCP socket on the MPTCP level, whereas lower in the stack, several subflows that are conventional TCP connections may be opened. This way, an application only has to deal with a single MPTCP connection and therefore may remain unchanged. MPTCP provides two levels of congestion control, as illustrated in Fig 1: at the subflow level, each sub

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flow is in charge of its own congestion control [12]. At the MPTCP level, coupled congestion control is provided to fairly share the network links among the subflows. So, by using multiple interfaces simultaneously, can improve quality and provide support for applications requiring high bandwidth.

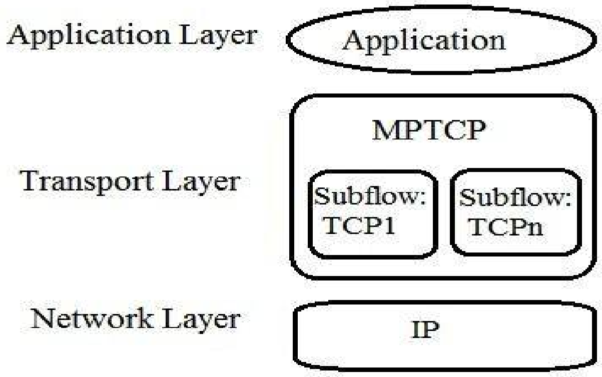

Fig. 1. MPTCP Architecture

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Still, there are some challenges to overcome such as:

1) 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 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 [15]. 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 2. There 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.

2) 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 underutilization of accumulated bandwidth capacity. This affects a lot to the video streaming applications that have stringent quality of service (QoS) requirements.

A. 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 such 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: It conserves message boundaries.
4) Unordered delivery: Stream Control Protocol can send message as ordered or unordered.

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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.

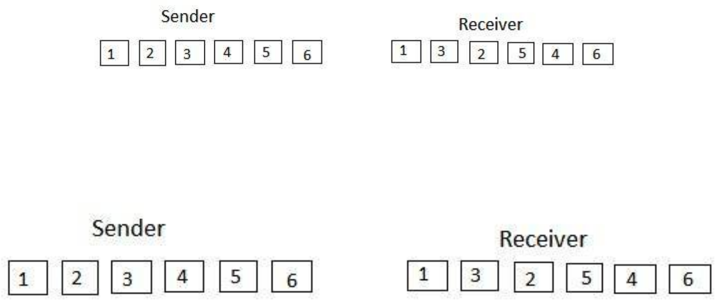

Fig. 2. Packet Reordering

B. Multipath Transmission Control Protocol (MPTCP)

A IETF working bunch need as of 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 usage and redundancy. They recommend MPTCP (Multipath TCP), a 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 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 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.

II. RELATED WORK

Vicky Sharma [1] a Multi-Path LOss-Tolerant (MPLOT) transport protocol that can realize significant bandwidth increases through the actual use of multiple heterogeneous end-to-end paths subject to very high and bursty loss rates. MPLOT provides higher goodput than simple bandwidth aggregation by exploiting multiplicity from multiple paths in the presence of delay heterogeneity across paths, and even with bursty, high, correlated loss rates. It is built on the fundamental principle of separating uniformity and congestion control. MPLOT makes actual use of erasure codes to provide reliability, coupled with loss rate assessment at the aggregate level across paths. However, an intelligent packet mapping design like the adaptive rank established method used by MPLOT is required to make preeminent use of the aggregate goodput across the diverse and dynamic component paths. In MPLOT, these effects are realized by sending the latest feedback on the best path and mapping packets to paths based upon a rank function that values shorter RTT, lower loss, and higher-capacity paths. MPLOT permits us to achieve a required tradeoff point between goodput and delay and limit the amount of retransmissions required for block-data recovery. In addition to delivering significantly higher goodput compared to other multipath transport protocols, MPLOT also achieves a lower delay. The delay is better performed, thus making MPLOT further proper for a large assortment of applications that seek reliable delivery under lossy conditions. MPLOT can be efficiently used for a wide range of applications to deliver better performance higher goodput, lower delay than remaining protocols under an extensive series of network conditions.

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Jiyan Wu, and Yuen et al. [2] a Bandwidth-efficient multipath streaming (BEMA) 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. [3] a multipath real-time transport (MPRTP) 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. [4] a novel Quality-aware adaptive concurrent multipath transfer (CMT-QA) 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. CMT-QA 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. [5] an effective end-to-end multipath transmission system to enable steady exist video gushing over multiple wireless networks stand on fountain code. Author also propose packetization-aware fountain code to incorporate several physical paths well and raise the fountain decoding possibility over wireless packet switching networks. They present 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. These 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++.

Vinh Bui [6] Online Policy Iteration (OPI) algorithm also uses a path state monitoring mechanism that complies with the end-to-end principle and captures congestion states of overlay paths. The Join the Shortest Queue (JSQ) algorithm is selected as the starting policy. When a new data bin arrives, OPI observes the current system state and takes an appropriate action following the current policy to distribute the data bin. Then, it evaluates the immediate reward for the action taken.

Sumet Prabhavat [7] Effective Delay Controlled Load Distribution (EDCLD) is to minimize the latency differences among different network paths for reducing packet reordering at the receiver and to efficiently balance load across these paths. E-DCLD consists of three functional components: traffic splitter to derive flow rate allocation ratios for different paths, path selector to select an appropriate path for each packet, and load adaptor to dynamically estimate the end-to- end delays on each path.

Jiyan Wu et al. [8] proposes a novel quAlity-Driven MultI- path TCP (ADMIT) scheme for multi-homed video communication over various wireless networks. This method combines the value maximization stood on Forward Error Correction (FEC) coding and rate distribution. It also achieves the best quality of concurrent video streaming, but seriously think about the path asymmetry in diverse access networks and the drawbacks of the data retransmission method in MPTCP. Moreover, the authority of proposed scheme over the challenging protocols becomes more evident as the amount of access networks increases. It is capable to incorporate the consistent access networks with FEC coding to reduce the back-to-back video alteration.

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III. CONCLUSION

The growth of video traffic over the Internet has become a major driving force for multihomed communications over parallel network paths. In this paper, we have studied different multipath transport protocol and scheme for video quality- guaranteed in wireless network. In network substructures, it is quite a key task to effectively deliver real time applications with delay, goodput, and reliability requirements. So, Goodput- Aware Load Distribution model is used to improve the goodput performance of video traffic over multipath networks. Here, various challenging problem of differentiated scheduling for real-time traffic flows with heterogeneous delay constraints, integrating various transmission features and abilities.

REFERENCES

[1] V. Sharma, K. Kar, K. K. Ramakrishnan, "A Transport Protocol to Exploit Multipath Diversity in Wireless Networks", IEEE/ACM Transactions on Networking, pp. 1024-1039, vol. 20, no. 4, 2012.
[2] 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.
[3] V. Singh, S. Ahsan, J. Ott, "MPRTP: multipath considerations for real time media", in Proc. of ACM Multimedia Systems, 2013.
[4] 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.
[5] 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.
[6] V. Bui, W. Zhu, et al., "A Markovian approach to Multipath Data Transfer in Overlay Networks", IEEE Transactions on Parallel and Distributed Systems, vol. 21, no. 10, pp. 1398-1411, 2010.
[7] S. Prabhavat, H. Nishiyama, N. Ansari and N. Kato, "Effective Delay-Controlled Load Distribution over Multipath Networks", IEEE Transactions on Parallel and Distributed Systems, vol. 22, no. 10, pp. 1730-1741, 2011.
[8] 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.
[9] S. Prabhavat, H. Nishiyama, N. Ansari, and N. Kato, "On Load Distribution over Multipath Networks", IEEE Communications Surveys and Tutorials, vol. 14, no. 3, pp. 662-680, 2012.
[10] K. Chebrolu and R. R. Rao, "Bandwidth aggregation for real-time applications in heterogeneous wireless networks", IEEE Transactions on Mobile Computing, vol. 5, no. 4, pp. 388-403, 2006.
[11] 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.
[12] S. Ferlin, T. Dreibholz and Alay, "Multi-path transport over heterogeneous wireless networks: Does it really pay off?", 2014 IEEE Global Communications Conference, Austin, TX, 2014, pp. 4807-4813.
[13] 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.
[14] A. L. H. Chow, H. Yang, C. H. Xia, et al., "Ems: Encoded Multipath Streaming for Real-time Live Streaming Applications", in Proc. of IEEE ICNP, 2009.
[15] 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.