LABORATORY IEEE 802.11 A OPEN PTMP LINKS

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ABSTRACT

Performance of wireless communications is a most relevant issue, resulting in more reliable and efficient communications. Laboratory measurements were made on several performance aspects of Wi-Fi (IEEE 802.11 a) Open point-to-multipoint links. Our study contributes to the performance evaluation of this technology, using available equipments (HP VM-200 access points and Linksys WPC600N adapters). New detailed results are presented and discussed, namely at OSI levels 4 and 7, from TCP, UDP and FTP experiments: TCP throughput, jitter, percentage datagram loss and FTP transfer rate data. Comparisons are made to corresponding results obtained for point-to-point links. Conclusions are drawn about the comparative performance of the links. *Keywords:* WLAN, Wi-Fi, IEEE 802.11 a, Open Point-to-multipoint and Point-to-Point Links, Wireless Network Laboratory Performance.

INTRODUCTION

Wi-Fi is a wireless communications technology working in the 2.4 and 5 GHz frequency bands. Nominal transfer rates are specified up to 11 (802.11b), 54 (802.11a, g) and 600 Mbps (802.11n) [1]. CSMA/CA is the medium access control method. Communications performance has been of prime importance, leading to increasing reliability and efficiency. Studies have been published on wireless communications, wave propagation [2,3], practical setups of WLANs [4], performance analysis of the effective transfer rate for 802.11b PTP links [5], 802.11b performance in crowded indoor environments [6]. Telematic applications have specific performance requirements, depending on application. New telematic applications are specially sensitive to performance, when compared to traditional applications [7]. Several Wi-Fi performance measurements have been made in the 2.4 and 5 GHz bands for open and secure point-to-point (PTP) links [8,9]. In the present work new Wi-Fi results are obtained, mainly through OSI levels 4 and 7, for IEEE 802.11a Open point-to-multipoint (PTMP) links. Comparisons are made to corresponding results obtained for point-to-point links.

RESULTS

The experimental arrangement for TCP, UDP and FTP measurements is shown in Figure 1. The experiments were made under far-field conditions using interference free communication channels. No encryption was activated in the AP and the wireless adapters of the PCs [10,11]. The experiments were made under far-field conditions. No power levels above 30 mW (15 dBm) were required, as the wireless equipments were close. For each nominal transfer rate, an average TCP throughput was determined from several measurements. This value was used as the bandwidth parameter for every corresponding UDP test, giving average jitter and average percentage datagram loss. Jitter, which gives the smooth mean of differences between consecutive transit times, was continuously computed by the server, as specified by the real time protocol RTP, in RFC 1889 [12]. The statistical analysis, including calculations of confidence intervals, was carried out as in [13]. FTP transfer rate measurements were made using FTP server and client applications. Batch command files were written to permit the TCP, UDP and FTP tests. The results were obtained through remote control from the official IP University network, via switch, and written as data files to the client PC disk. Figures 2-3 show TCP throughput results for Open PTP and PTMP links, respectively. Figure 4 shows UDP-jitter results for Open PTMP links.

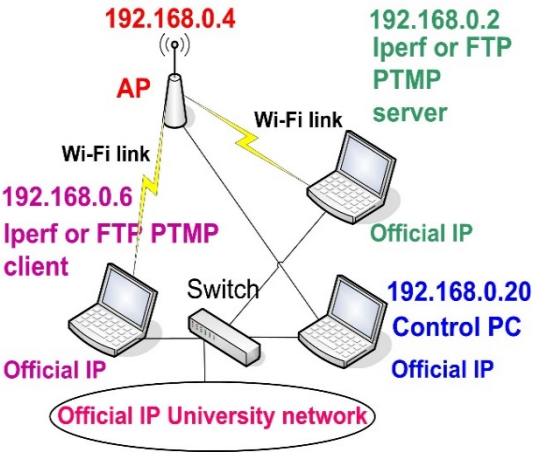

Figure 1. Laboratory setup scheme.

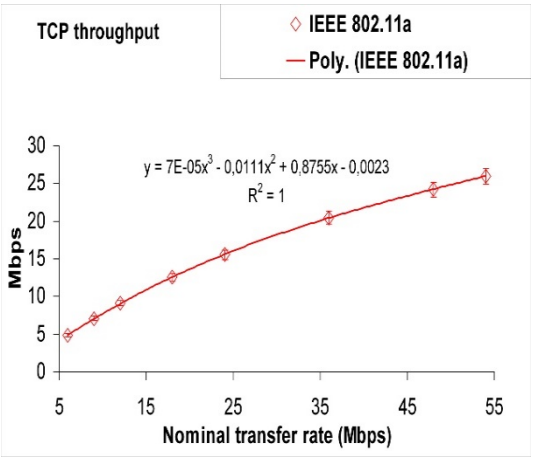

Figure 2. TCP throughput versus technology and nominal transfer rate; Open PTP.

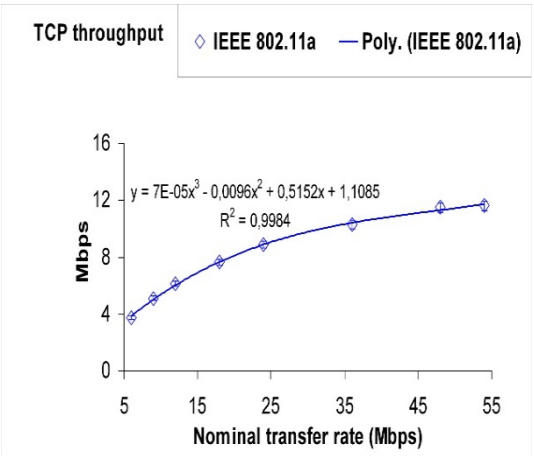

Figure 3 TCP throughput versus technology and nominal transfer rate; Open PTMP.

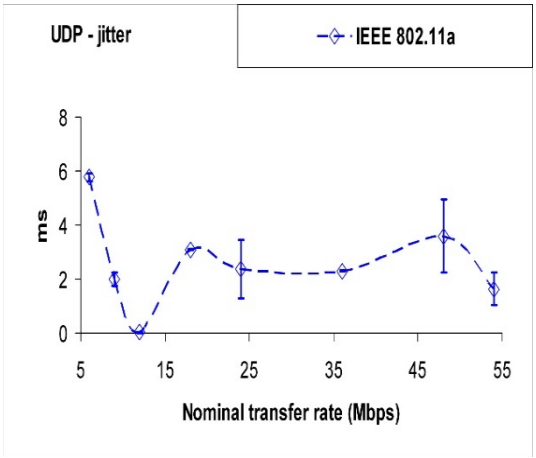

Figure 4. UDP – jitter results versus technology and nominal transfer rate; Open PTMP.

CONCLUSIONS

The best average TCP throughput, jitter and percentage datagram loss performances were found for PTP links. In comparison to PTP links, performance degradations were found for PTMP links, where the access point has to maintain links between PCs and processing requirements increase.

Further performance studies are planned using several equipments, standards, topologies and security settings, not only in laboratory but also in outdoor environments involving, mainly, medium range links.

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