

The study of radio coverage and service quality of a Campus-Wide Wireless Network

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Abstract – The appearance and development of mobile equipment led to a growth in the usage of Wi-Fi networks. At present, in order to access the Internet, the most used networks are the ones based on the IEEE 802.11 standard. These networks were conceived to service a limited number of customers with a symmetric traffic for uplink and downlink and concurrently with a limited coverage area dependent by the access point (AP) radio transmission power. The herein paper describes the tools and the steps followed to increase the radio coverage and to improve the quality of the services provided by a campus network made of 200 interior and exterior Wi-Fi hot-spots managed by one Alcatel-Lucent OmniAccess dedicated controller.

Keywords: Wi-Fi networks, radio analysis, radio coverage, optimization, QoS, radio map

I. INTRODUCTION

The contemporary society is more and more based on mobile equipment and wireless communication allowing mobile users to access information anywhere, anytime in a timely and cost-effective ways. According to ITU statistics the number of mobile (cellular) subscriptions worldwide at the end of 2014 is more than 6.95 billion, close to the size of worldwide population [1]. Smartphone ownership in developed markets surpassed featured phones ownership in 2013 [2]. Smartphone penetration rate on developing markets follows also and increasing trend [2]. It seems that in every aspect of our live, the ability to communicate becomes more and more important, with people using mobile terminals on a daily basis for phone calls, email, to access the Internet and applications of social networks. For most employees, the phone or the tablet has become a compulsory instrument that accompanies them everywhere, including at their workplace [3].

The term “Wi-Fi” refers to local wireless networks which use the specifications of the IEEE 802.11 standard versions. A new version of the IEEE 802.11 family of standards, IEEE 802.11ac, has recently been

defined with the promise of delivering significant increases in bandwidth while improving the overall reliability of a wireless connection [3]. The main goal of this standard is to provide wireless data rates compared to common wired LAN infrastructures, over 1 Gbps bandwidth. Wi-Fi networks are used in schools, campuses, companies and homes, as an alternative to LAN wired networks. Usually, hotels, cafes, airports and, generally, public places offer public access to Internet by Wi-Fi, these locations being called “hotspots” [4]. Despite their spread, wireless networks are still lacking the performance and quality of wired networks. The recognized problems of WLAN still remain the radio coverage and variable transfer rates, both resulting in poor quality of services.

The present paper represents a starting point in the improving of the radio coverage capacity, as well as in the quality of the services provided by EduRoam network of the Politehnica University of Timisoara. The first step in the making of this project was finding the software and hardware instruments, needed for determining the present state of functioning of the network and its evaluation from the point of view of the radio coverage and transfer rates. The second step was generating a radio coverage map by using dedicated software for measuring the radio signal power strength of the AP's. The measuring was made within the premises of the campus, inside the main university buildings and outdoor, in the nearby park. The next step implied the correlation of the radio coverage with the transmission rates of the AP's in different locations, beginning with the area with the best signal quality and ending with the area with worst signal quality, within the measured areas. The last aspect of this study is the interpretation of the results and the offer of a solution based on coverage, quality and cost for a maximum exploitation of the network.

The following sections will cover a part of the most important scientific contributions to this subject.

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