Επεξήγηση Δ.Ε. 1 και 2

Διπλωματική Εργασία No. 1: **Ποιότητα Υπηρεσιών, κινητικότητα και ενεργειακή κατανάλωση σε Ασύρματα Τοπικά Δίκτυα (WiFi)**
Διπλωματική Εργασία No. 2: **Βελτιστοποίηση των παραμέτρων του MAC επιπέδου σε Ασύρματα Μητροπολιτικά Δίκτυα (WiMAX) για την ελαχιστοποίηση της ενεργειακής κατανάλωσης.**

In the past few years, mobile handhelds for use in cellular technologies met a widespread deployment. But cellular technologies have been proved inadequate to provide high-speed and reliable wireless access. In order to extend the capabilities of wireless networks, to include both transmission of Voice and data, and in addition to converge to the new era of all-IP networks, IEEE has standardized both 802.11 for Wireless Local Area Networks (WLANs), and 802.16 for Wireless Metropolitan Area Networks (WMANs). However both technologies, in their first versions, bore significant drawbacks in offering Quality of Service features, low Energy Consumption and Mobility capabilities.

It is therefore widely recognized that Next Generation Networks (NGN) are going to implement such broadband technologies for providing QoS Enabled Telecommunication Services. Under NGN Wireless architectures, another key challenge must be taken into account: mobile devices are battery limited. In fact, how to prolong the lift time of a mobile device and minimize power usage, is a very important design issue. Wireless operation means that the user is expected to roam freely, which must also be taken into account. The dependability of NGN operation is obviously depended on these two features.

Nowadays, Wi-Fi hotspots have been deployed in rural areas offering Local Access and large data rates in LAN's over the air. Wi-Max systems allow for Broadband Wireless Access (BWA), in a larger coverage area and with higher capacity capabilities. While also Wi-Fi systems are less complex than WiMAX ones, they tend to have lower costs of implementations. Thus they can provide low cost access over small spaces. On the other hand Wi-MAX systems can be effectively used as backhaul in Wi-Fi LANs and 3G networks. The advantages of Wi-MAX backhaul operation is that it provides large capacity, high throughput and lower cost implementations compared to other wired counterparts. Thus it becomes apparent that Wi-Fi and Wi-MAX can complement each other.

The 802.11 Task Group E has completed the design of the QoS MAC enhancements, which has resulted in the 802.11e extension of the standard. The 802.11e defines the Hydrid Coordination Function (HCF) to support QoS. Two channel access methods are included: Enhanced Distributed Channel Access (EDCA) and a contention free channel access, referred to as HCF-controlled Channel Access (HCCA). Finally, there is a need to evaluate the trade-off between QoS features and energy consumption. For example, under the differentiation of EDCA scheme, a specific traffic priority must wait longer time, thus affecting the energy consumption. And conversely, the wireless stations shall remain awake to answer to the AP polls in the HCCA period. For these reasons, the IEEE

802.11e defines a new method to deliver the frames buffered at the AP while the station is in Power Save (PS) Mode, the Automatic Power Save Delivery (APSD). APSD is very useful in VoIP applications where the data rates are roughly the same in both directions. The AP can choose between the standard Power Save Mode and the APSD mode. In APSD mode, two types of Service Periods are defined: a) the unscheduled-APSD (U-APSD) and b) the scheduled-APSD (S-APSD). However the Wi-Fi Alliance has started certification of the Wi-Fi multimedia extensions (WMM^{TM}) and the WMM Power Save^{TM} which include the distributed type of access, EDCA and EDCA plus U-APSD functionality.

While in the legacy IEEE 802.16 has been designed only for subscriber stations (SSs), the emerging 802.16e can upgrade the Fixed BWA (FBWA), to mobile service provisioning (Mobile Service Stations- MSSs). As a part of this handover and sleep mode operations are also included. The standard differentiates the applications serviced in four access classes with different access mechanisms. Moreover, the standard defines a correlation between energy consumption and QoS by providing different types of Power Saving Classes. More specifically, a MS has two operation modes, namely awake mode and sleep mode. Only in the awake mode can a MS transmit/receive data. However special care should be taken into account due to the bursty traffic characteristics of various applications such as WEB browsing. In order to use energy more efficiently, the MS can be absent from the serving BS in sleep mode during the pre-negotiated period which is composed of sleep and listening windows.

In these theses, we are going to present a thorough overview of QoS, Energy Consumption and Mobility characteristics of the two standards. Explanations of the 802 protocols and other wireless technologies included in Heterogeneous NGN wireless systems will be given e.g. discontinuous reception mechanism (DRX) of UMTS.

Επιθυμητά Μαθήματα (όχι υποχρεωτικά): Δίκτυα Υπολογιστών, C/Java, Τηλεπικοινωνιακά Συστήματα 1

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Υποχρεώσεις του φοιτητή:

- Για την υλοποίηση της διπλωματικής απαιτούνται, 2 μέρες την εβδομάδα παρουσίας στο εργαστήριο
- Παρουσίαση της εξέλιξης κάθε εβδομάδα στον μεταπτυχιακό φοιτητή
- Αναλυτικές Παρουσιάσεις κάθε μήνα για την εξέλιξη υλοποίησης

Βιβλιογραφία:

A)

- Computer Networking: A top down approach, Kurose/Ross
- 802.11 Wireless Networks: The Definitive Guide
- Papers και λοιπό υλικό θα δοθεί

B)

- WiMAX Handbook, Mc-Graw Hill Communications
- Computer Networking: A top down approach, Kurose/Ross
- Papers και λοιπό υλικό θα δοθεί