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TKK / Communications Laboratory / MHa

S-72.3240 Wireless Personal, Local, Metropolitan, and Wide Area Networks

Exam on Wednesday 10.5.2006

Please do not fill in this exam sheet

1. Answer true (T) or false (F) to the following statements. You will be given 1p for a correct answer, -1p for an incorrect answer, and 0p if there is no answer.

   a) 2.4 ... 2.4835 GHz band is a valid Industrial, Scientific and Medical frequency band.
   b) IEEE 802.15.4 Low Rate WPAN (ZigBee) is based on TDMA.
   c) The host controller interface in Bluetooth equipment is an open interface.
   d) A Bluetooth piconet is an ad-hoc network with 1 master and up to 7 slave devices.
   e) The Network Allocation Vector (NAV) indicates the length of a data frame in μs.
   f) In an IEEE 802.11 BSS, the BSSID is in fact the IP address of the access point.
   g) The QoS standard IEEE 802.11e offers different priority levels for different services.
   h) EAP (Extensible Authentication Protocol) is based on MAC address filtering.
   i) The IEEE 802.16 (WMAN) MAC layer offers fragmentation of MAC PDUs.
   j) Unlicensed Mobile Access (UMA) basically offers GPRS services over WLAN.

2. Fill in the missing terms (/words/expressions). For each correct term you will be given 1p. For each incorrect or missing term you will be given 0p.

   An example of MAC address (a) is "___"and IPv4 address (b) is "___ ". IAPP offers mobility in the (c) ___ layer whereas Mobile IP offers mobility in the (d) ___ layer. WEP (Wired Equivalent Privacy) supports, e.g., the (e) ___ and (f) ___ but not the (g) ___ security mechanism. In an IEEE802.16 (WMAN) system, a burst profile indicates a (h) ___ and (i) ___ combination and the burst profile can be changed from (j) ___ to ___.

3. Explain the differences between the CSMA/CA (Carrier Sense Multiple Access / Collision Avoidance) and CSMA/CD (Carrier Sense Multiple Access / Collision Detection) schemes.

4. Explain a basic public key cryptography scheme. Explain the reason why such a scheme is used, and how it is used in practice.

5. The IEEE 802.11g PHY layer is based on OFDM (Orthogonal Frequency Division Multiplexing) where the OFDM symbol duration is 4.0 μs, the useful symbol time is 3.2 μs, and the guard time is 0.8 μs. In this example, we assume that the modulation is 16-QAM and the convolutional coding rate is 3/4.

   a) Calculate the subcarrier spacing interval.
   b) Calculate the number of bits per subcarrier (after modulation but before coding).
   c) Calculate the number of bits per OFDM symbol (after modulation and coding).
   d) Calculate the corresponding bit rate during OFDM symbol transmission.
   e) Is this bit rate available for a single WLAN user, when there are no other active WLAN users in the Basic Service Set? Please justify your answer.