SISTEMAS E REDES MULTISERVIÇO

Practital Exercises nº 3 – Access Networks

1. Knowing that:
   - For each ADSL carrier, 50Kb can be transmitted
   - At the exit of the operator plant there is a maximum of 480 carriers for download
   - The attenuation effect implies the fall of a carrier every 10 metres

   Calculate the maximum download speed for a client with:
   a. ADSL access at 500mts from the operator plant;
   b. ADSL access at 2.5Km from the operator
   c. ADSL access at 5.5Km from the operator

2. Calculate the maximum time required to download a 1GB file using the following accesses:
   a) Analog modem connection at 54kbps
   b) ADSL connection at 16Mbps/1Mbps with 1:20 containment
   c) Connection on a CATV network at 30Mbps/3Mbps

3. An enterprise wants to implement a VoIP system via the Internet for its voice communications. It needs 4 calls simultaneously. Considering that each voice channel requires 32kbps (symmetric), do you consider that it will be possible to implement reliably this system through:
   a) Access ADSL 8Mbps/1Mbps with containment rate of 1:50?
   b) GPON access 30Mbps symmetrical in a situation where the user fiber section has the maximum possible connected and active users and considering a containment rate of 1:3 of the operator's central?

4. A CATV operator has a 98-channel offer in PAL-BG system with 8Mhz per channel and intends to provide Internet access via DOCSIS 3.0. Knowing that uses coaxial cables with 850MHz bandwith, will it be possible to offer 400Mbps download output without removing channels from the offer?

5. Calculate the minimum amount of lasers that a Fiber Internet operator needs to place in a plant serving a set of 8000 customers if you use each of the following technologies:
   a) P2P access without intermediate switching;
   b) GPON

6. Evaluate which is the best financial option for an operator of an FTTH: a P2P network without switching or a GPON network with a 1:4 split at 250mts from the central followed by 1:16 splits 400 mts from the central. Other information:
   - Number of customers: 420
   - Average distance from customers to central: 750mts
   - Fiber cost: 19€ per 10mts
   - OLT cost with 8 LEDs: 2500€
   - Splitters 1:4 cost: 20€
   - Splitters 1:16 cost: 30€
   - Consider that ONTs have similar cost to GPON or P2P

7. Using the site http://anisimoff.org/eng/lte_throughput_calculator.html, and knowing that we are on an LTE network with the following conditions:
   - Radio access with 10MHz bandwidth
   - Network conditions allow modulation 64 QAM
   - The user is in the area of 4 antennas

   a) Calculate the maximum speed a user can get

   b) Consider that in the same zone are 8 users who induce the same load on the network. What would be the speed that each user would have available?