Universidad de León
Bachelor Degree on Computer Science and Engineering
Course on Computer Networks

Weekly Homework no. 4 (WH₄-Lecture)

*Note that this WH covers only the material given in the Lecture of Thursday 16th – April-2020. **WH₄-Practice** will be published on Wednesday 22nd-April-2020.*

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Submission date: 30th-April-2020
Submit via: foces.informatica.unileon@gmail.com
Format: Only **pdf** format is accepted. Include your name and ID in the document.

--- Study Guide ---

1. **To be read carefully**: These weekly homework assignments do count to the supplementary component of your final grade according to the official Course Guide updated on 21st-April. The Weekly Homework is a valuable means for you to remain fully involved with the course while away from campus.

2. At all times, have the textbook by Peterson & Davie at hand. Most of the material that we have taught so far belongs in book chapters 1 and 2. Find the 6th edition to the book, here:

   https://github.com/SystemsApproach/book/releases/download/v6.1/book.pdf

3. A key resource as you study the lessons contained in the assigned presentations is the Questionnaires, which you can find at the following link under section titled "Questionnaires"

   http://paloalto.unileon.es/cn/

4. Check out the Questionnaires that are to be solved this week and which are listed in the deliverables section, below. By this time, all the course topics needed for these questionnaires have been taught in the Lectures or proposed for self-study while we are away from campus.

Try to resolve the relevant exercises on your own; only after working your solutions is it acceptable to consult the solutions published in paloalto.unileon.es/cn. I may ask you to submit your personal solution to some exercise from some Q in which case I expect that you add some value to the solution that was already published by me.

5. If you need assistance, contact me via the email given above; I recommend that you send your comments and your questions to the **class forum** in the Agora.

Weekly Homework (WH₄)

*This section **is** to be included in your homework submission. These exercises will be assessed. You must submit your original work and cite sources in case you used some.*

Base documentation

1. **Lecture slides:**

   http://paloalto.unileon.es/cn/lect/CN-Ch3-2018-Lan-Sw-ST.pdf

2. **Various CN Questionnaires and past exams at paloalto.unileon.es/cn**

Exercises and examples about the lectures

1. **BySinc and HDLC datalink protocols offer a mechanism known as transparency.** This mechanism detects the presence of the sentinels used for delimiting the datalink header fields. If the payload given to the datalink protocol contains the bit pattern corresponding to a sentinel, the transparency mechanism ensures that it won't confuse the receiver. Respond to the following questions about the Ethernet technology:

   a. Does Ethernet use sentinels?

   b. Explain how an Ethernet receiver becomes aware about the end of an Ethernet frame

   c. Protocol P is using an Ethernet for transmission, is P allowed to submit any payload to the Ethernet datalink or some bit patterns are prohibited?

2. **An original Ethernet system uses a transmission speed of 10Mbps** (10M bits/s). If the cable length is the máximum acceptable (2500 m), then the resulting Rtt is 51,2µs.

    a. Calculate how many bits can be transmitted in the period of time of the Rtt.

    b. The collision detection (CSMA/<u>CD</u>) mechanism requires that an Ethernet not transmit a frame length less than 512 bits.

    c. Explain the reason for this minimum frame length.

    d. What adverse effect is derived when a transmitter doesn't comply with the preceding specification.

3. **As for the Exponential Backoff algorithm which we introduced in the lecture:**

    a. What is Ethernet's *Channel Capture effect?*

    b. An Ethernet interface E_1 has undergone 1 collisions in its attempt to transmit a frame A; at the same time, an Ethernet interface E_2 has undergone 3 collisions in its attempts to transmit frame B. After the last collision, both hosts execute *Exponential Backoff,* whereby we ask you to compute the probability that E_1 wins the backoff.

    c. Now, compute the probability that another collision takes place.

    d. Last, compute the probability that the backoff time generated by E_2 be greater than or equal to 102,4 µs.

4. **Imagine that you have to explain the difference between the shared** media Ethernet (Coaxial cable or with Hubs) and the switched media Ethernet (Bridges or Switches) to a person not knowledgeable with networking.

    a. Compose a clear and concise explanation.

    b. Now, assume that the person for whom you are devising the explanation knows how to program computers. Would you change your explanation in this case, somehow?