



ESCUELA TÉCNICA SUPERIOR DE
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Departamento de Tecnología Electrónica


Computer Networks

Theoretical Study lab 2:
Layered architecture. Basic tools.

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Lab 2: Layered architecture. Basic tools.

Objectives of the lab:

- Manage the ping tool for connectivity testing and round-trip delay measurement from a end system.
- Handle the tracert tool for the measurement of the delay from round trip to jump.
- Use the ipconfig tool to view the TCP/IP configuration of a final system with Windows OS.
- Relate the different elements (hardware/software) that appear in the laboratory with the OSI reference model and the TCP/IP architecture.
- Familiarize the student with the basic management of a protocol analyzer (Wireshark, can be downloaded  from <http://www.wireshark.org/download.html>).

Previous study

The following questions must be resolved in a justified and handwritten, before the laboratory session:

1. Determine the name given to the level that handles datagram addressing and forwarding functions in the TCP/IP architecture, indicating how peer entities at this level exchange PDUs. Briefly explain, with the help of a graph, the encapsulation process at this level. Also, indicate the name of the top and bottom level.
2. Make a graph showing two end systems, A and B, connected by a router. The graph should show for each device the layers it uses and for each layer which peer features are communicating with each other. Assume that the **TCP/IP reference model** is used.
3. Assume that end system A in the previous section sends a message to B (A_PDU, application-level PDU) containing 1200 bytes of A_UD (application-level UD) and that final system B immediately returns a 600-byte response message from A_UD to A. The time elapsed from when A starts transmitting until it receives the full response is 11.8 ms. Justifiably determine the value of R (in bps) of the link between B and the router, as well as the nodal delay that occurs in the router **when sending** each of the messages. To solve the problem, you need to make the following assumptions:
 - a. Each level, except the physical level, adds 10 bytes of PCI.
 - b. The processing delay, d_{proc} , is so small that it can be ignored
 - c. The propagation delay, d_{prop} , is 0.07 ms on the two links.
 - d. There are no more end systems, apart from A and B, generating traffic on the network.
 - e. The bandwidth of the link between A and the router is 8 Mbps.
4. Find out the meaning of the following¹ acronyms corresponding to typical Internet protocol names: HTTP, DNS, TCP, UDP, and IP. In addition, for each of those protocols, you must indicate at what level of the TCP/IP architecture it performs its functions.

¹ You can consult the bibliography or the Internet.