Name:
Date:
Lab partner name (if any):
Total time spent on lab:
Time spent using GNS3:

NOTES:

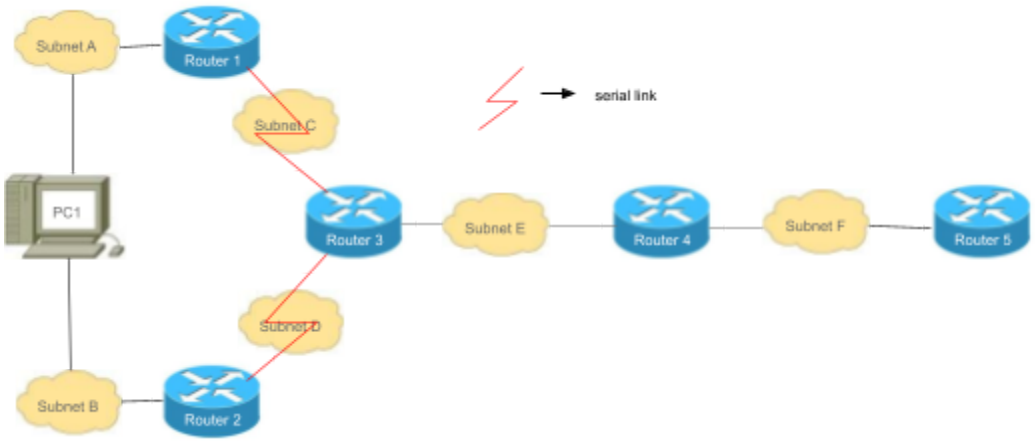
- For all questions, when you are asked to give evidence to support your answers, be sure that your evidence thoroughly supports your statements and proves to the grader that the experiment was carried out.

Lab 5 - OSPF (140 pts)

Lab Description:
OSPF is a link state routing protocol, in which each router sends information on the cost metric of its network interfaces to all other routers in the network. The information about the interfaces is sent in messages that are called *link state advertisements* (LSAs). LSAs are disseminated using *flooding*; that is, a router sends its LSAs to all its neighbors, which, in turn, forward the LSAs to their neighbors and so on. However, each LSA is forwarded only once. Each router maintains a link state database of all received LSAs, which provides the router with complete information about the topology of the network. Routers use their link state databases to run a shortest-path algorithm that computes the shortest paths in the network.

OSPF is one of the most important link state routing protocols of the Internet. The functionality of OSPF is rich, and the lab exercises highlight only a small portion of the OSPF protocol. The Internet Lab uses OSPF version 2 (OSPFv2).

The network configuration is shown below:



	Subnet A	Subnet B	Subnet C	Subnet D	Subnet E	Subnet F
IP Prefix						
PC1						
Router 1						
Router 2						
Router 3						
Router 4						
Router 5						

Step 1 - Develop an addressing plan for Topology I (see table in table above), and configure the devices to implement the plan. *Include the addressing plan in your lab report (10 pts).*

Step 2 - Using a single OSPF Area, configure OSPF on all the PCs (using ***zebra***) and Routers to provide IP connectivity between all devices in the network. *Include evidence of this connectivity in your lab report using `ping`, packet captures, and OSPF information. (20 pts)*

Step 3 - Using routing tables or `ping` with wireshark (or both:) determine the path used by traffic from PC1 to R5, then determine the time it takes for OSPF to converge on a new route from PC1 to R5 following deletion of the serial link on the current path (you must use the serial link because routers don't detect the deletion of Ethernet links in GNS3). To do this start a `ping` from PC1 to R5, delete the appropriate link, then monitor how long it takes for the ping test to be successful again (noting that `ping` sends 1 packet per second). *Include the following in your lab report:*

a. *The convergence time you measured, supported by command output and packet captures. (10 pts)*
b. *An explanation of what accounted for the time it took for this convergence, supported by packet captures. (20 pts)*
c. *An explanation of how one of the routers (pick one) computed new routes in response to the topology change, supported by OSPF configuration information and packet captures of OSPF exchanges. (20 pts)*

Step 4 - Re-configure OSPF to use OSPF Areas. Specifically, include Subnets A-D in Area 1, Subnet E in Area 0 (the *backbone area*), and Subnet F in Area 2. *Include evidence of IP connectivity in your lab report using `ping`, packet captures, and OSPF information. (20 pts)*

Step 5 - Using the link state databases from the routers in Area 0, explain how the *backbone area* is used to improve the scalability of OSPF. *Include this explanation in your lab report. (20 pts)*

Step 6 - Using packet captures, explain how the Area 0 link state databases are computed. *Include this explanation in your lab report. (20 pts)*

Corrections, comments and suggestions for improving this lab greatly appreciated!