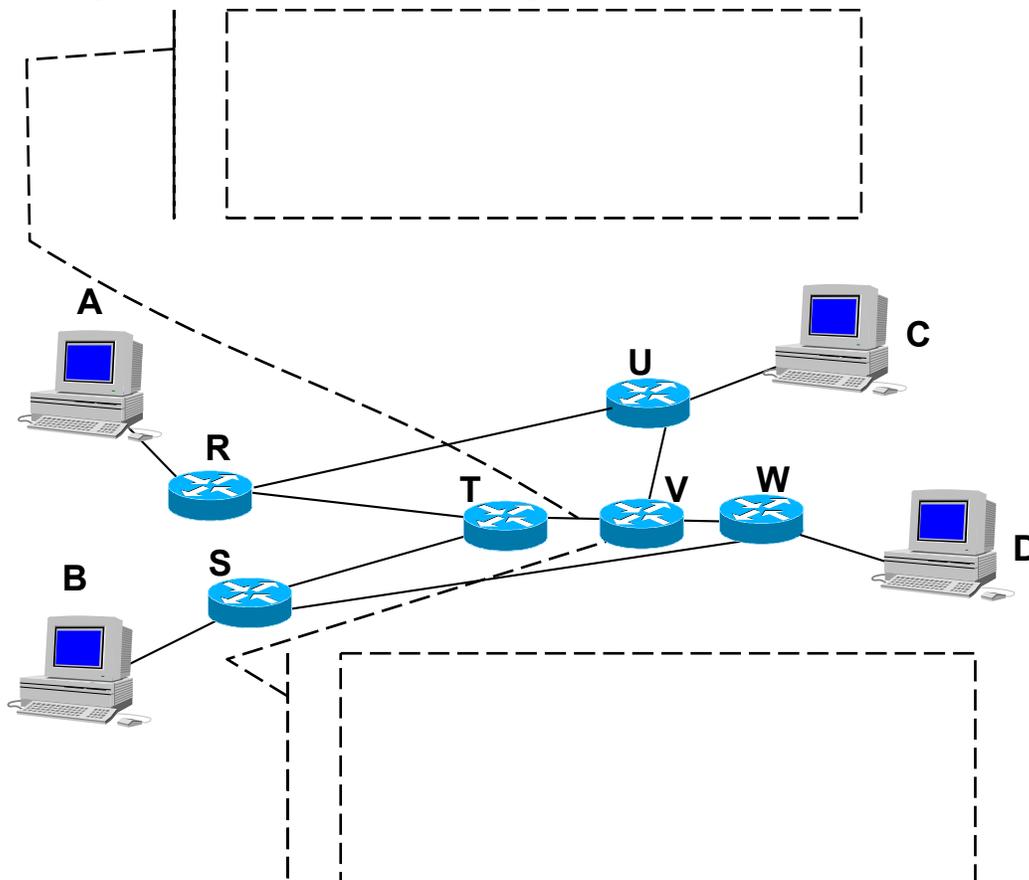


Computer Networks Technologies and Services	February 20th, 2019
First and last name	Student ID

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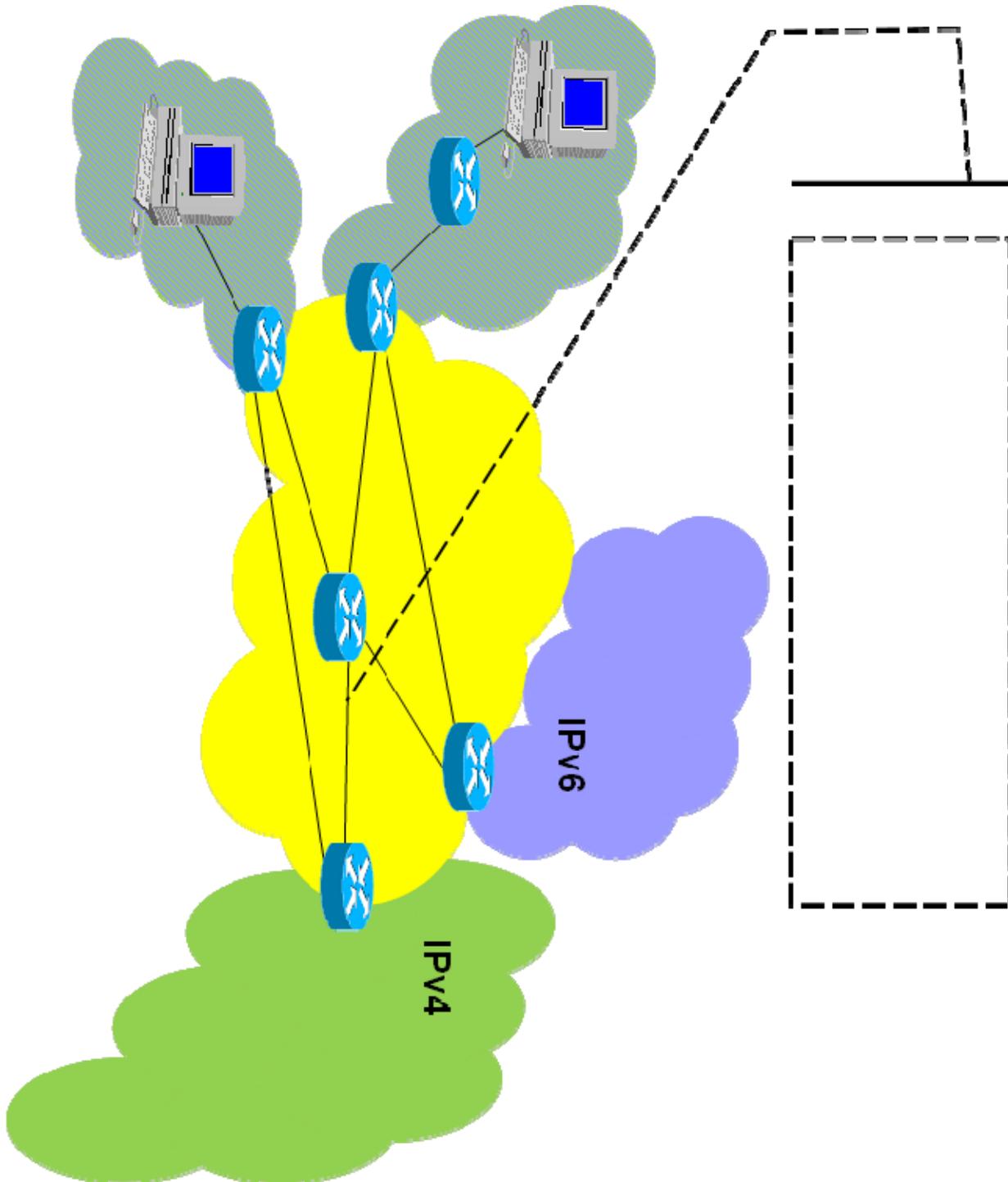
- i. Nothing else than what is needed to write (pen, eraser), a piece of ID, and possibly water and food can be taken to the seat where you take your exam. Please leave any other item you might have (coat, bag, phone, calculator, and any other object) at the front or back of the classroom.
- ii. The answers to each question must be written exclusively on the same page of the question, which is the only material that will be graded.
- iii. Do not forget to write your name and student ID in each one of the marked spaces on the exam paper.
- iv. In case you will use part of pages containing the questions as a scratch pad, please indicate it clearly and possibly cross out such parts before handing in the exam.
- v. The score assigned to answers varies from zero to the maximum score reported at the end of the question. Please notice that the maximum scores of all questions do not necessarily sum up to 30.
- vi. When answering questions, please feel free to use drawings whenever they can help expressing and clarifying the answer.
- vii. Answers that are not understandable (for example because written badly or with bad handwriting) might be considered wrong.
- viii. During the test, any communication with other classmates is prohibited and will cause the student to be sent away from the classroom
- ix. The instructors and the assistants that are present during the test are there for the sole purpose of verifying proper progress of the exam. Their role is not giving any support to the interpretation of the text, neither helping the students to correctly formulate the answers. Please avoid any such request.

Question 1) In the network depicted below the letter close to each router and host represents its identifier (e.g., address). List, directly in the corresponding dashed box, the routing information sent by V to T, and the routing information stored by V (at steady state), assuming that all routers in the network in the figure are using a routing protocol based on the link state algorithm. (10 points)



Question 2) Considering that the figure below represents a typical DS-lite deployment scenario during the transition from IPv4 to IPv6,

1. Assign one or more IP addresses to each interface of each host and network device (writing it directly on the figure, close to the interface itself) that are required to enable the two hosts in the figure to communicate with one another, the IPv4 internet, and the IPv6 internet. (6 points)
2. Annotate (directly on the figure) the (name of the) role played by devices and/or functionality offered (beyond regular IP packet forwarding) and their parameters that are key for the DS-lite solution to actually work. (2 points)
3. Write in the dashed box information carried by the various headers of a packet transiting on the link indicated in the figure that is instrumental to the proper operation of the solution. (6 points)



Question 3) A SIP user with address `alice@xyz.com` is connected to the network of her Internet service provider and starts her software phone to call `bob@iptel.org`. Assuming that the softphone static configuration includes only the SIP address of its user, list in a schematic fashion all the messages sent and received by the softphone of the user, from the instant it is launched to the instant in which the user starts talking to the called party. Consider messages of all possible involved protocols and for each of them clearly indicate the entities sending and receiving it. (10 points)

Question 4) Given the MPLS Layer 3 VPN scenario depicted in the following figure, list all the actions that involve the router pointed by the arrow for setting up LSPs that are instrumental in enabling communication among the various corporate networks shown in the figure. Please use the following notation to describe each action:

- binding: B, <FEC>, <label>
- distribution: D, <from>, <to>, <FEC>, <label>
- mapping: M, <input label or FEC>, <output label>, <next hop>

where the first letter identifies an action and what follows are the corresponding parameters. Please consider the letter besides each interface in the figure as the IP address assigned to the interface itself. (10 points)

