

# Computer Netzwerke und verteilte Systeme Summer 2025



## Exercise 3: Overlay Routing

Prof. Dr.-Ing. Matthias Hollick  
Secure Mobile Networking Lab - SEEMOO

cnuvs@seemoo.tu-darmstadt.de  
<https://seemoo.de/cnuvs>

**Deadline:** The deadline for this exercise is **20.05.2025, 23:55** and in total **18 bonus points** can be achieved.

**Bonus points:** *Computer Netzwerke und verteilte Systeme* features a bonus point system to acknowledge first-rate performance. Exercise points count as bonus. Throughout the entire course, a bonus of up to a maximum of 0.7 can be obtained. The bonus does not help in passing the exam: You need to pass the exam with a 4.0 or better before any bonus is applied.

**Group size:** The recommended group size for submissions is 3. You may also submit your exercises as a group of 2 or alone if you do not find a group.

### Task 1: Group Exercise: Distance vector routing

Initialize the final routing tables for each node (A, B, C, D) in the given network topology with the given connection costs. Analyze the consequences of a link failure between C and D and create the updated tables for three rounds based on the previous tables. Explain the problems that occur and propose a possible solution to this problem.

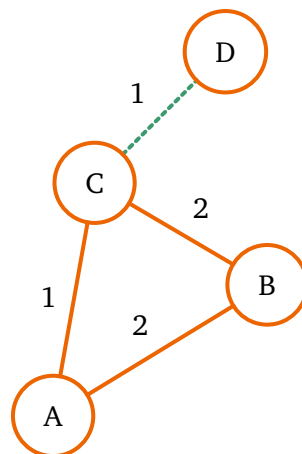


Figure 1: Topology for task 1

### Task 2: Group Exercise: Overlay Routing

State the routing paths in the overlay depicted in Figure 2, the hop count in the underlay, and the stretch factor for the link from A to E.

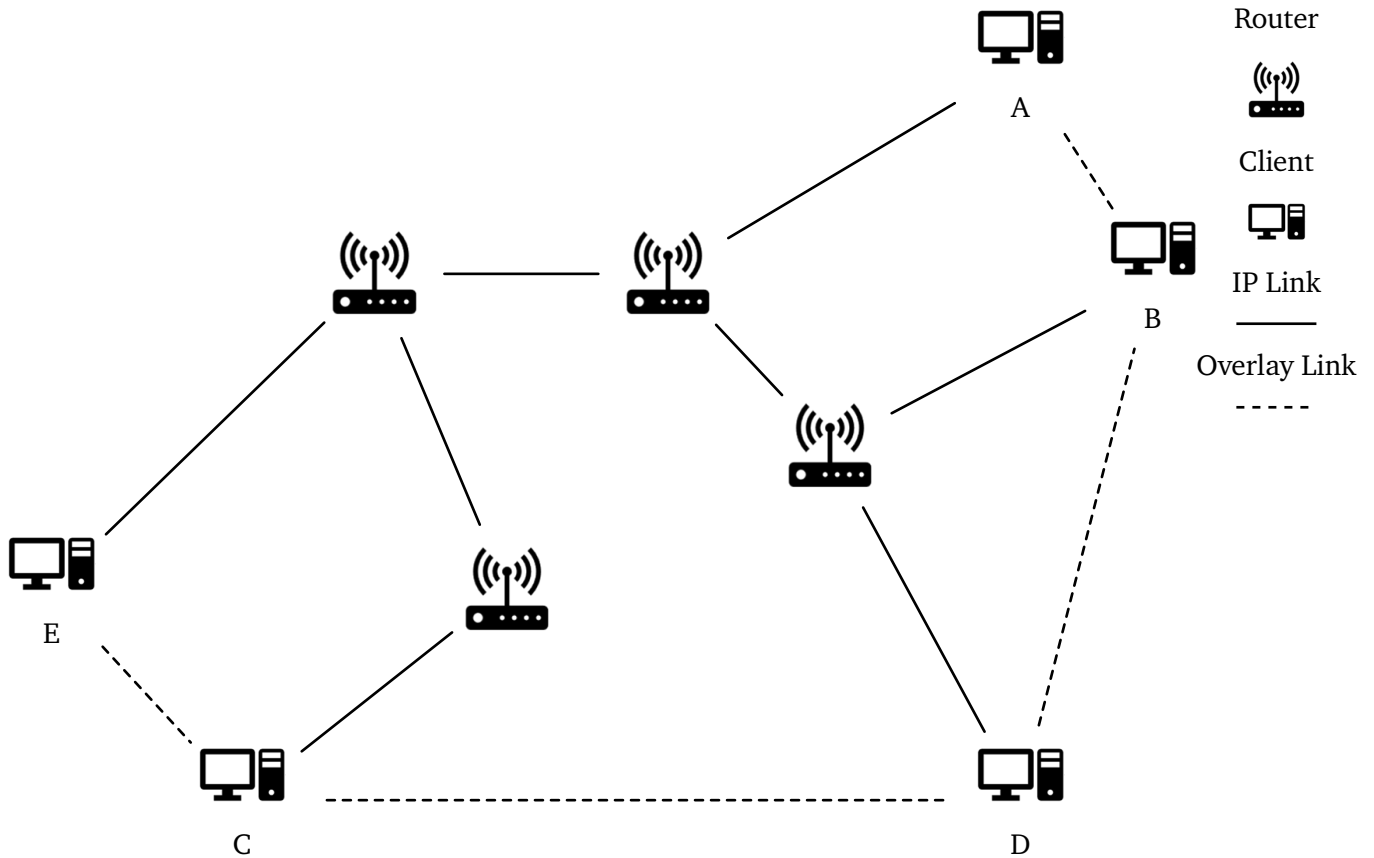


Figure 2: Overlay Routing Topology for Task 2

### Task 3: Overlay Routing (8 Points)

- Explain the relationship between neighboring nodes in the overlay network and neighboring nodes in the underlying network. (1 P)
- What are the general assumptions for peer-to-peer overlays? (2 P)
- Explain the two important goals for overlay routing. Which method does each of them use to determine the best path? (2 P)
- List three applications that employ overlay routing. (3 P)

**Attention:** Submissions without references will not be graded! Please add sources.

### Task 4: Overlay Routing (6 Points)

State the routing paths in the overlay depicted in Figure 3, the hop count in the underlay, and the stretch factor for the:

- Link from A to B. (2 P)
- Link from B to E. (2 P)
- Link from F to A. (2 P)

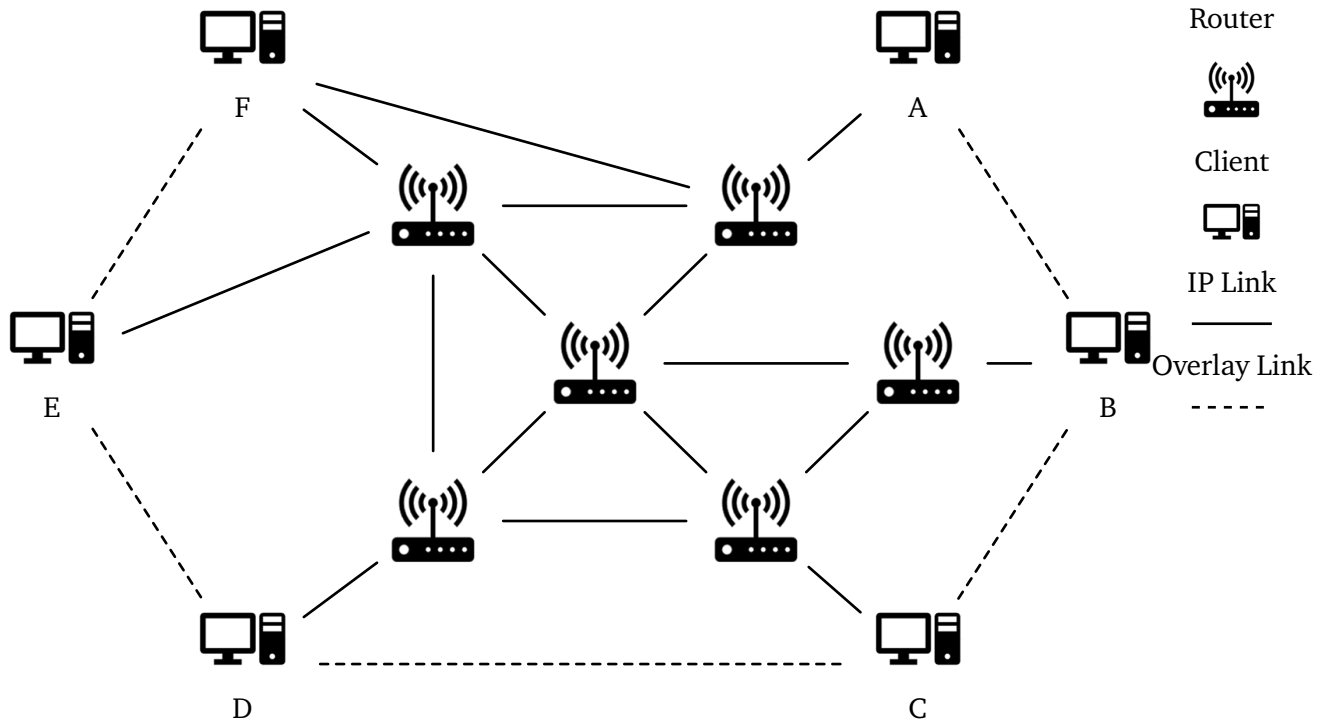


Figure 3: Overlay Routing Topology for Task 4

#### Task 5: Transport Layer (4 Points)

- Name the two primary transport-layer protocols of the Internet. Which services do they provide, and to which category of protocols do they belong? (2 P)
- Why aren't operating system PIDs used to address remote processes? (1 P)
- What is the Internet approach to identifying remote processes, and how does it work? (1 P)

**Attention:** Submissions without references will not be graded! Please add sources.