Communication Network Design Lab – Task Submission (Task #2)

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In the following table, we report the results we have obtained (here, we have always used k = 10); we have added some values for the capacities because we wanted to see for which of its value the VWP case had a solution and the WP case didn't.

Link capacities [Gbps]	RF VWP	RF WP
10	No solution	No solution
15	No solution	No solution
17	No solution	No solution
18	228	No solution
19	228	No solution
20	228	228
25	228	288

Since each node has to send 3 units of traffic to each other node, each one has to send a total of 18 units of traffic.

This is why in the table of results we can see that the RF-VWP formulation has no solution for $C < 18$.

For the RF-WP case, in general it behaves worse than the RF-VWP formulation; indeed, we have a solution only for $C \geq 20$. This is due to the fact that the RF-VP formulation is more constrained than the RF-VWP one.

The reason why the optimal solution is the same between the two formulations, when found, is due to the fact it doesn't matter which wavelength is used, still we're routing the same requests and therefore the total amount of used capacity is the same.

The parameter playing a fundamental role in determining if a solution is found or not in the RF-WP formulation is W = number of wavelength per fiber.

Here, we fix k = 10 and C = 20 (for all links):

Offered traffic per demand (D)	W	Solution for RF_WP
2	12	No solution
2	13	152
3	18	No solution
3	19	228

What we have understood is that (N = number of nodes in the network):

- W ≤ D*(N-1) → no solution.
- W > D*(N-1) → solution.

This is because each node needs to send traffic to all the other nodes (no N-1); this means that it needs at least D*(N-1)+1 different wavelength to send its traffic.

All the material for our task is available at this GitHub link:

https://github.com/LucaFerraro/Communication_network_design_lab