

Operations Research, Spring 2019 (107-2)

Case Assignment 2

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The company NEC Taiwan's story and challenges are the same as those in Case 1. Relevant data are also available in the MS Excel file "OR107-2_case01_data.xlsx" provided with Case 1. Therefore, below we will list your tasks directly.

1 Your tasks

1. (20 points) Suppose that the facilities construction decision has been made (so each facility has been determined to be shutdown or remain open). Give this information, formulate a Linear Program that may find an optimal engineer allocation and customer assignment plan for NEC Taiwan.

You may have noticed that as your Linear Program can only have fractional variables, which cannot satisfy the "assign one customer to exactly one facility" requirement. In this problem, let's ignore this issue and assume that we may assign one customer to multiple facilities. You then need to determine the proportion of visits that should be completed by each assigned facility.

You may have also noticed that the numbers of engineers should not be fractional. As we require you to formulate a Linear Program, let's also ignore this issue. If an optimal solution really has a fractional value of engineers, we will round it up or down and do some manual adjustment. You may hire new engineers if needed (and to simplify this problem, let's ignore engineers' wage).

In short, please formulate a "Linear" Program and do not have non-fractional variables. For this problem, please write down a compact mathematical formulation. Do not submit a computer program.

2. (20 points) Submit a (set of) computer program that may solve the Linear Program you formulated in Problem 1. You may submit an AMPL model file and an AMPL data file. Alternatively, you may submit a (set of) Python or C++ programs that invoke gurobi to solve this problem.

3. (20 points) Suppose that, for some reason, it has been determined that the Tamsui and Tainan facilities will be shutdown, and the other nine facilities will remain open. Use your computer programs submitted in Problem 2 to help NEC Taiwan determine how to allocate engineers and assign customers. Write an executive summary by providing the following information: the number of customers assigned to each open facility, number of engineers allocated to each open facility, and total cost (i.e., your objective value associated with your optimal solution). Do not submit the detailed customer assignment.
4. (20 points) Repeat Problem 3 but shutdown the Tamsui and Kaohsiung facilities.
5. (20 points) With your Linear Program on hand, would you design a way to help NEC Taiwan solve the facility construction problem? Please design a method and write it down. You do not need to find an optimal solution; this problem will be graded based on the correctness and applicability of your method.

2 Submission rules

- **Teams.** Students should form teams to work on this case study. Each team should have three to four students. Each team should make only one submission.
- **Things to submit.** Please submit a (set of) computer programs (for Problem 2 above) and a PDF file (for the other problems). Include the student IDs and names of all team members in both files.
- **Where to submit.** Please submit all files to NTU COOL. Each team should make only one submission, i.e., only one student should make a submission.
- **Deadline.** The deadline of this assignment is 2:00 pm, April 15, 2019. Works submitted between 2:00 pm and 3:00 pm will get 10 points deducted as a penalty. Submissions later than 3:00 pm will not be accepted.

3 Final note

As you have not really learned anything from this course, this case assignment is designed for you to understand this problem and experience the difficulties of real-world decision problems. We do not expect you to perfectly solve this problem. Therefore, as long as

you provide a reasonable way to find a reasonable solution, you do not need to worry too much about your grades. Nevertheless, trying to solve challenging problems is always interesting. Maybe you may find an optimal solution! If you have some free time, why not give it a try?