Object-Oriented Programming and Design - Monsoon 2023
Project – File Handling, Inheritance and Code Management

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This project carries a total of 140 marks. The first five parts each carry a total of 20 marks. The last part carries a total of 40 marks. All the parts need to work as part of two distinct programs (Q 1-5 and Q6), but these two distinct programs need to share classes.

Suppose you are creating a program to keep track of the data used by the Telecom Regulatory Authority of India (TRAI). TRAI keeps track of the usage of radio frequency spectrum, as well as the generations of cellular networks used by Indian telecom users.

1. TRAI auctions spectrum at different range of frequencies, and receives different amount of money via such auctions. Moreover, these auctions are done in different states and union territories separately. Given a record of an auction (as a csv file) on a specifying date which says which company bid for which spectrum range, create an appropriate data structure to store it.

2. Assume that the telecom company's details, such as the number of subscribers in each circle across technology generations are also stored by TRAI. The data of such subscribers for all the past months is given as another csv file. Design a data structure to keep track of this data.

3. A key challenge for TRAI is the hoarding of RF spectrum by large telecom companies to keep out competition from the market. To prevent such problems, assume that TRAI now has imposed a policy that anybody having a usage density (measured as spectrum allocated per user) in a circle will not allowed to bid for fresh spectrum. Allocate spectrum by reading the data structure accordingly.

4. TRAI usually prints a report of the spectrum allocated, the revenue generated by such allocation and the companies that received the spectrum. It also keeps a record of these decisions taken for future. Design a report to show such record, and ensure that you store it in a file, so that these decisions can be re-loaded automatically.

5. A newer technology that is likely to be used is that of mobile virtual network operators (MVNO). These operators do not buy the spectrum directly from the government, but utilize the same license from some other companies. Assume that you need to keep track of this data in addition to (2).

6. Now, assume that whenever a MVNO requests spectrum from a licensed telecom operator, it needs to check whether the request is legitimate. It does so by checking if a secret HASH code given to the MVNO is actually used with the request. If the request is legitimate, then it again checks whether the spectrum density is low enough to accommodate such request. Design a class structure for both types of telecom operators (licensed and MVNO's) to allow such sharing of radio frequency spectrum. Generate a report on the screen to show how MVNO's and telecom operators have made requests for spectrum, provided that you have the patterns of user requests given in CSV files.

What and How To Submit

- The C++ program sources. Classes and inheritance must be used wherever appropriate.

- `Makefile` to compile the sources and generate the running binary for the shell. The Makefile should generate two versions of the binary – one for debugging and another for optimized execution.

- Utilization of multiple files to run the entire program is compulsory.

- A readme text file, explaining the commands needed to build the file, and the format of the input files. If code is copied from anywhere else (not that copying from any other student is plagiarism, but using textbook or open-source code is allowed), that should be mentioned here.

- At least 4 significant commits on a **private** github repository, with proper descriptions of the commits. You may have as many commits as you wish.

- Make the assigned TA the admin of the github repository, **and** submit the same code in zipped form on Google Classroom by the due date.

Late Submission Policy

- -0.25 per hour for the first 96 hours.

- Submissions beyond 4 days of delay would only be accepted with official leaves of absence.