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Project – Milestone 1

Breakdown Analysis of the Problem

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Created Date	27-10-2020

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What comes in to the program?

MobileDevice

- A configuration file consisting of the device's network address and device name stored as strings.
- A reference (contractTracer) via an object to interact with the class which is acting as a server i.e., Government.
- The following details of other users/devices when they are detected by the mobile device.
    - Hash code or unique identifier of other user in the form of a string.
    - Date of contact which will be provided as a number (integer) from 01/01/2020.
    - Number of minutes for recording the duration of the contact.
- A unique identifier of the test in the form of a string if the user wanted to report a positive test to the system.

Government

- A configuration file containing the following information as strings:
    - Domain name of the database.
    - Username to access the database.
    - Password to access the database.
- The following details of other contacts for a particular mobile device along with its unique identifier as initiator (a string) which is a hash code of device's network address and device name.
    - Contacts (each device's name, duration of contact, date of contact)
    - Positive test hashes (if the user called to report a positive test)

  Please note that the data associated to contacts and positives test hashes would be stored as a string when it arrives into the class and it has a particular format such as XML (or any).
- Test result details such as a unique identifier of the test (testhash) stored as a string, date of the test in the form of a number (starting from the date of 01/01/2020) and result of the test (true if positive and false if negative).
- Details associated to gatherings such as date of gathering as an integer starting from the date of 01/01/2020), minimum size (number of individuals) to be considered it as a

gathering. Also, minimum time limit for a contact and a threshold value to indicate it as a large gathering.

What transformations do I need to make to the data?

- Format the contact details in each MobileDevice when you are calling synchronizeData() in order to exchange the data with the server i.e., Government.
- Transform the device's network address and device name as a unique identifier into a hash value by combining both the parameters.

What part of the data is processed right away?

- Device's network address and name can be processed immediately to create a unique identifier.
- Database details can be used to quickly connect to the database.

What part of the data do I need to keep longer?

- Details associated to unique identifier of each individual needs to be stored throughout the course of the program.
- The contact information from each mobile device needs to be stored explicitly along with details such as date and duration of the contacts for identifying the gatherings and for sending notifications in case if the individual is tested positive.
- All the test results along with the individual details and its (test) associated unique identifier need to be stored as part of this program.
- Details associated to database such as domain name, username and password also needs to be stored in order to reconnect again when the connection is lost due to some intermittent issues.

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What goes out of the program?

- In last 14 days, if an individual is in contact with another individual who has been tested COVID positive.
- The frequency of larger gatherings.
- The details associated to contacts and tests (if any) from each mobile device syncs with the government server.

What assumptions can I make?

- The input parameter 'individual' for recordContact() is a hashcode of each initiator i.e., a combination of device name and address.
- The given database details are correct since it is the core component of the program.
- Same set of data i.e., pair of device's network address and device name would not be repeated.
- Update the contact if its already present (do not create duplicate contacts).
- The following are case sensitive:
    - Device name and address
    - Database details
- Do not create a new device if the same mobile device is given twice.

What constraints exist?

- date>0 (recordTestResult(), recordTestResult(), findGathering() and readContact())
- duration>0 (readContact() and findGatherings())
- minSize>0 (findGatherings())
- minTime>0 (findGatherings())

Are there strange cases to handle?

- An individual reporting positive test result for the second time or more.

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What is important for the solution to do?

- Both the entities (classes) i.e., MobileDevice and Government should be able to interact with each other and exchange data efficiently.
- The program should have the ability to precisely notify the users if they have been in contact with any of the individual who has been tested positive in the last 14 days.
- The implementation should also help in identifying the frequency of large gatherings.

Summary of the analysis

- The individual users who are uniquely identified by a hash value based on their device's address and name exists as an instance of MobileDevice.
- The individuals can then use the methods of MobileDevice to
    - add the details (contact hash, date and time of duration) of other people they have been in contact.
    - upload the contact details to government server and identify if they have been in contact with any COVID positive tested person in the last 14 days.
    - upload their positive test to government server (to let them know).
- In addition, the government server would have the ability to identify the frequency of large gatherings and report back to users if they have been in contact with any COVID positive tested person in the last 14 days. It also has the ability to store the test results of an individual.