INSTRUCTION:

Design and implement a Java application for the application described below. You must apply `Composite` Design Pattern.

Create an application to simulate the Windows file system. The file system consists mainly of two types of components — directories and files. Directories can be made up of other directories or files, whereas files cannot contain any other file system component. In this aspect, directories act as nonterminal nodes (which represent composites) and files act as terminal nodes (which represent individual components) of a tree structure.

Figure 1 shows an example of a hierarchy of file system objects that could be created. A client (in terms of code) can query any of these objects for its size in kilobytes. For example, when the client `CompositeDemo` is run, the following output is displayed:

```
Main Folder Size= 6000kb
SubFolder1 Size= 3000kb
File1 in SubFolder1 Size= 1000kb
File2 in SubFolder1 Size= 2000kb
```

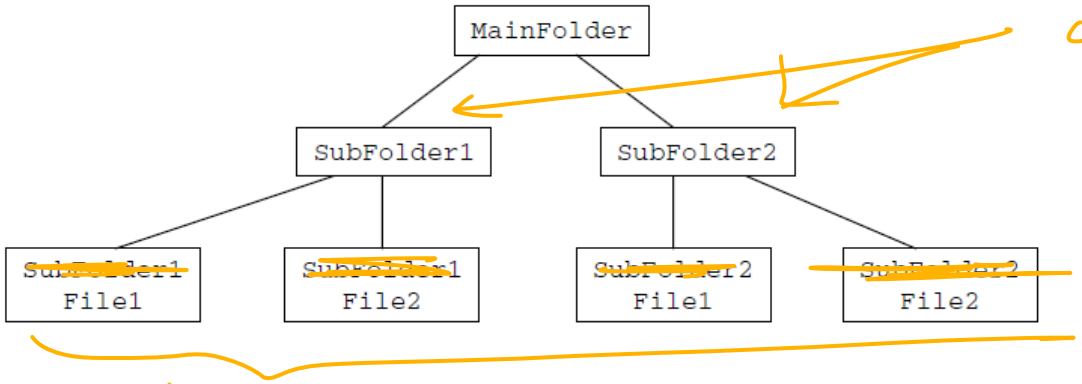


Figure 1

1. Apply `Composite` Design Pattern to design your system. Draw a UML class diagram to show your design for the system.

   Hints: Define a common interface for both directories and files in the form of a Java interface `FileSystemComponent`. The `FileSystemComponent` interface declares methods that are common for both file components and directory components.

   Define two classes, namely, `FileComponent` (to represent a file) and `DirectoryComponent` (to represent a directory), as implementers of the common `FileSystemComponent` interface. Use an ArrayList to store the files in a `DirectoryComponent` object.

   You need to include the relevant methods and also a `getComponentSize()` that will return the size (in kilobytes) of a file or a directory.

2. Implement your design in Java.

3. Test your implementation by writing a client class `CompositeDemo` to construct the file system hierarchy as in Figure 2 and the output below:

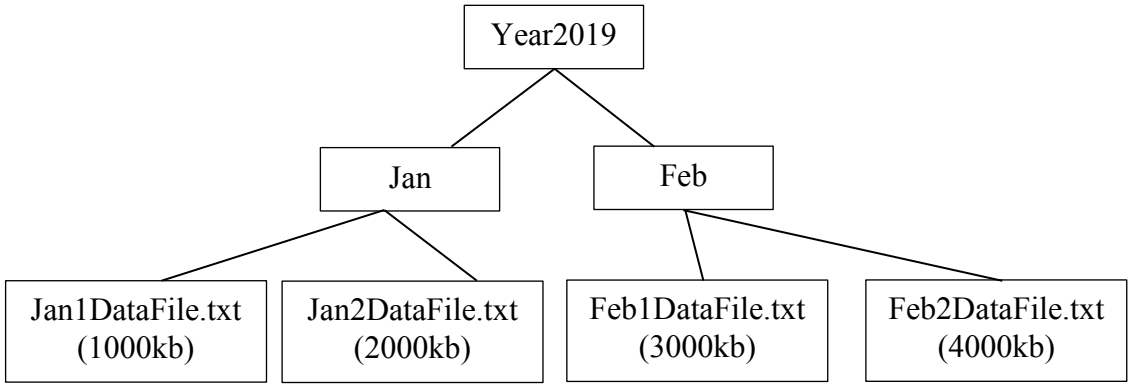
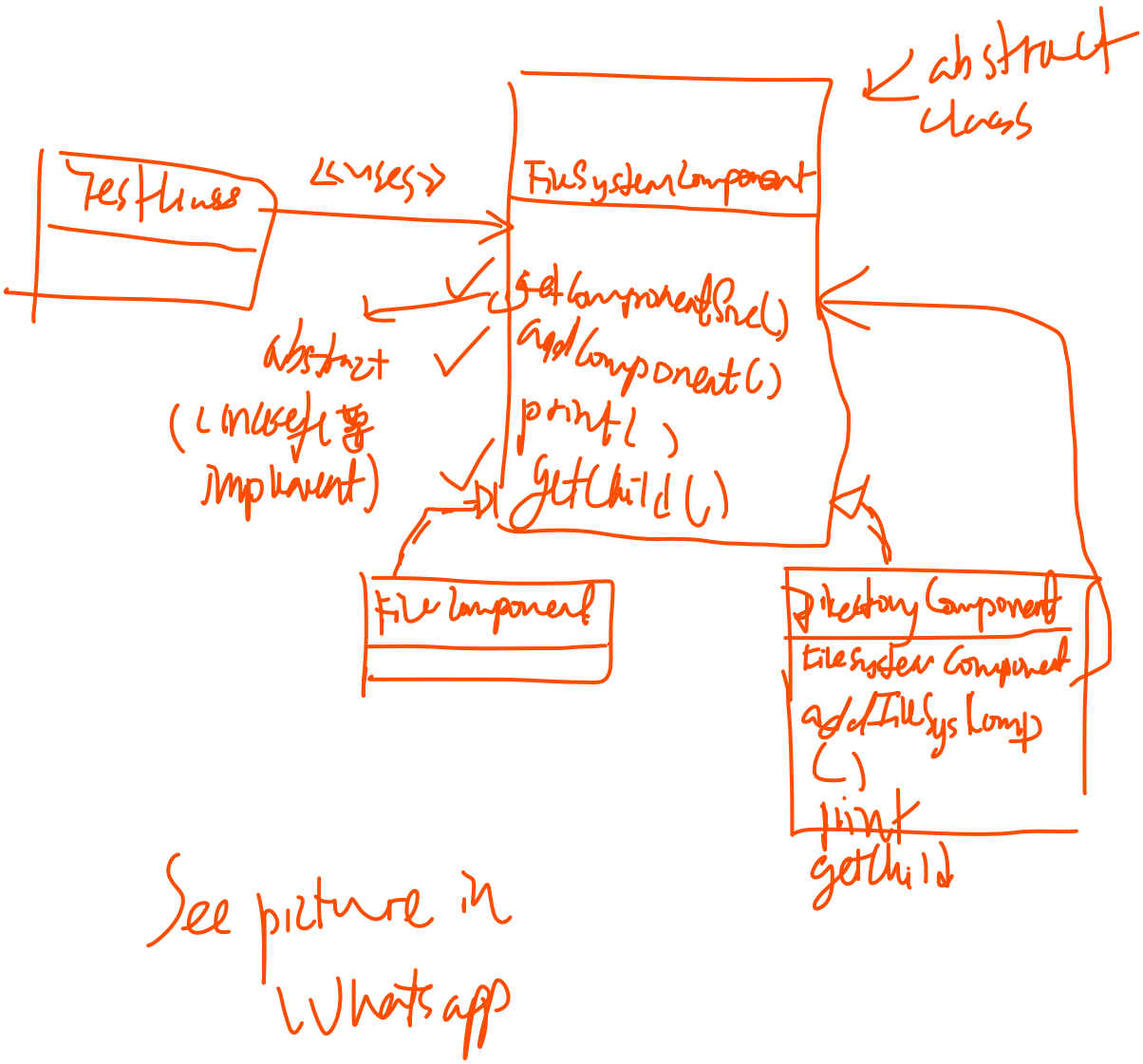


Figure 2

Output:

```
Year2019 Folder size= 10000kb
Jan Folder size= 3000kb
Jan1DataFile.txt in Jan Folder size= 1000kb
```



See picture in WhatsApp