Swinburne University of Technology

COS20007 Object Oriented Programming

Semester test

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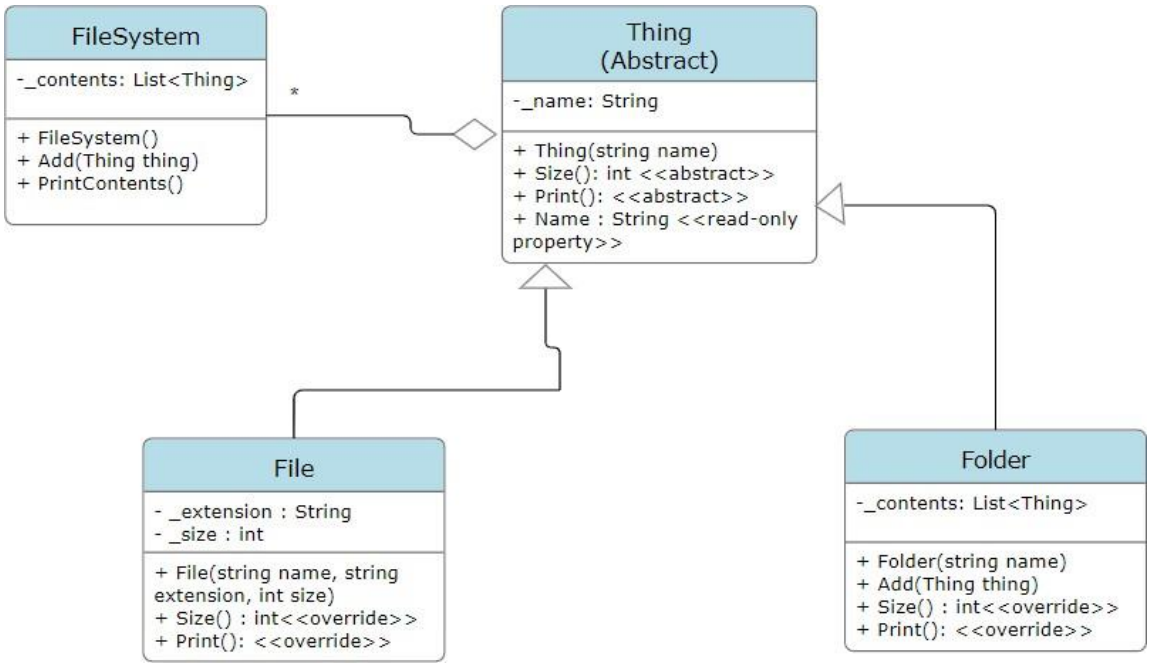

FileSystem
-_contents: List<Thing>
+ FileSystem()
+ Add(Thing thing)
+ PrintContents()
*
Thing
(Abstract)
-_name: String
+ Thing(string name)
+ Size(): int <<abstract>>
+ Print(): <<abstract>>
+ Name : String <<read-only property>>
File
- _extension : String
- _size : int
+ File(string name, string extension, int size)
+ Size() : int<<override>>
+ Print(): <<override>>
Folder
-_contents: List<Thing>
+ Folder(string name)
+ Add(Thing thing)
+ Size() : int<<override>>
+ Print(): <<override>>

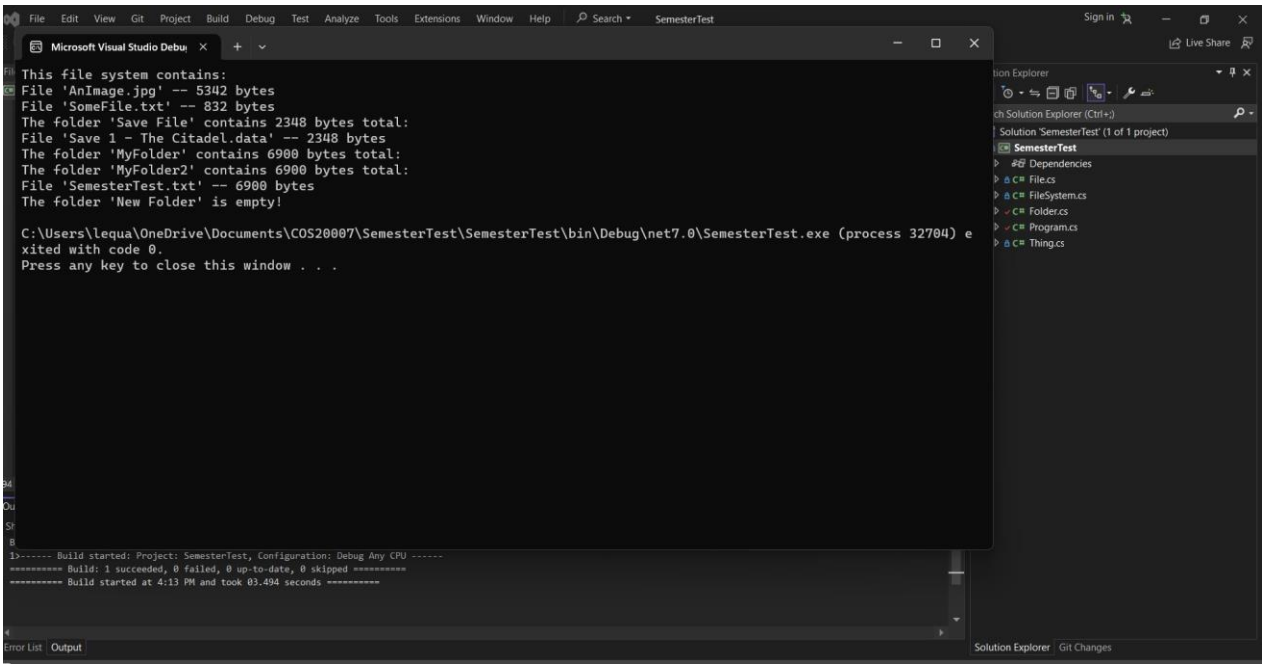
```
using System;
using System.Linq;
namespace SemesterTest
{
    class Program
    {
        static void Main(string[] args)
        {
            FileSystem fileSystem = new FileSystem();

            //Add File
            fileSystem.Add(new File("AnImage.jpg", ".jpg", 5342));
            fileSystem.Add(new File("SomeFile.txt", ".txt", 832));

            //Add Folder contains file
            Folder folder = new Folder("Save File");
            folder.Add(new File("Save 1 - The Citadel.data", ".data", 2348));
            fileSystem.Add(folder);

            //Add Folder contais folder that contains file
            Folder folder2 = new Folder("MyFolder");
            Folder subFolder = new Folder("MyFolder2");
            subFolder.Add(new File("SemesterTest.txt", ".txt", 6900));
            folder2.Add(subFolder);
            fileSystem.Add(folder2);

            //Add empty folder
            fileSystem.Add(new Folder("New Folder"));

            fileSystem.PrintContents();

        }
    }
}
```

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace SemesterTest
{
    public class FileSystem
    {
        private List<Thing> _contents;

        public FileSystem()
        {
            _contents = new List<Thing>();
        }
        public void Add(Thing thing)
        {
            _contents.Add(thing);
        }

        public void PrintContents()
        {
            Console.WriteLine("This file system contains: ");
            foreach (Thing thing in _contents)
            {
                thing.Print();
            }

        }
    }
}
```

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Xml.Linq;

namespace SemesterTest
{
    public abstract class Thing
    {
        private string _name;
        public Thing(string name)
        {
            _name = name;
        }
        public string Name
        {
            get { return _name; }
        }

        public abstract int Size();
        public abstract void Print();
    }
}
```

```
using System;
using System.Collections.Generic;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace SemesterTest
{
    public class Folder : Thing
    {
        private List<Thing> _contents;

        public Folder(string name) : base(name)
        {
            _contents = new List<Thing>();
        }

        public void Add(Thing thing)
        {
            _contents.Add(thing);
        }

        public override int Size()
        {
            int folderSize = 0;
            foreach (Thing thing in _contents)
            {
                folderSize += thing.Size();
            }
            return folderSize;
        }

        public override void Print()
        {
            if (_contents.Count != 0)
            {
                Console.WriteLine($"The folder '{Name}' contains {Size()} bytes
↪ total:");
                foreach (Thing thing in _contents)
                {
                    thing.Print();
                }
            }
            else
            {
                Console.WriteLine($"The folder '{Name}' is empty!");
            }
        }
    }
}
```

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace SemesterTest
{
    public class File : Thing
    {
        private string _extension;
        private int _size;

        public File(string name, string extension, int size) : base(name)
        {
            _extension = extension;
            _size = size;
        }
        public override int Size() { return _size; }
        public override void Print()
        {
            Console.WriteLine($"File '{Name}' -- {_size} bytes");
        }
    }
}
```


This file system contains:
File 'AnImage.jpg' -- 5342 bytes
File 'SomeFile.txt' -- 832 bytes
The folder 'Save File' contains 2348 bytes total:
File 'Save 1 - The Citadel.data' -- 2348 bytes
The folder 'MyFolder' contains 6900 bytes total:
The folder 'MyFolder2' contains 6900 bytes total:
File 'SemesterTest.txt' -- 6900 bytes
The folder 'New Folder' is empty!
C:\Users\lequa\OneDrive\Documents\COS20007\SemesterTest\SemesterTest\bin\Debug\net7.0\SemesterTest.exe (process 32704) exited with code 0.
Press any key to close this window . . .
SemesterTest
Solution 'SemesterTest' (1 of 1 project)
Dependencies
File.cs
FileSystem.cs
Folder.cs
Program.cs
Thing.cs

Task 2

1. Describe the principle of polymorphism and how it was used in Task 1.
   -Polymorphism in object-oriented programming allows different objects to respond to the same method or message based on their individual types. In Task 1, it's used by having the File and Folder classes override the Print and Size methods from the common base class Thing. This enables the FileSystem class to work with a collection of mixed File and Folder objects, treating them uniformly through the common interface provided by Thing. This promotes code flexibility and reusability.

2. Consider the FileSystem and Folder classes from the updated design in Task 1. Do we need

both of these classes? Explain why or why not.

-In the updated design from Task 1, both the FileSystem and Folder classes are necessary:

FileSystem Class: Represents the entire file system, providing a top-level container for organizing and managing all elements within it.

Folder Class: Represents folders or directories within the file system, enabling hierarchical organization of files and subfolders. Folders are essential for structuring and navigating the file system.

3. What is wrong with the class name Thing? Suggest a better name for the class, and explain the

reasoning behind your answer.

-The class name "Thing" is insufficiently descriptive and fails to convey its role within the file system context. To enhance clarity and comprehension, a more appropriate name like "FileSystemItem" or "FilesystemElement" should be used. These names explicitly indicate that the class represents an element or item within the file system, such as files, folders, or related entities. This increased specificity aids developers and maintainers in quickly grasping the class's intended function and usage, improving code readability and long-term maintainability. By opting for a more descriptive name, you contribute to a more comprehensible and maintainable codebase.

4. Define the principle of abstraction, and explain how you would use it to design a class to represent a Book

-The principle of abstraction in software design involves simplifying complex systems by modeling them using a set of abstract and simplified representations. It allows developers to focus on essential features and hide unnecessary details. Abstraction helps manage complexity, improves understandability, and enhances code maintainability.

- Here's a simplified example of how I could design a Book class:

```
public class Class1
{
    1 reference
    public class Book
    {
        2 references
        public string Title { get; set; }
        2 references
        public string Author { get; set; }
        2 references
        public int YearPublished { get; set; }
        2 references
        public string ISBN { get; set; }

        0 references
        public Book(string title, string author, int yearPublished, string isbn)
        {
            Title = title;
            Author = author;
            YearPublished = yearPublished;
            ISBN = isbn;
        }
        0 references
        public void DisplayInfo()
        {
            Console.WriteLine($"Title: {Title}");
            Console.WriteLine($"Author: {Author}");
            Console.WriteLine($"Year Published: {YearPublished}");
            Console.WriteLine($"ISBN: {ISBN}");
        }
    }

}
```

In this design:

-Abstraction of Attributes: We abstract the essential attributes of a book, such as title, author, year published, and ISBN, as properties of the Book class. These attributes provide a high-level view of what's important about a book without exposing unnecessary implementation details.

-Constructor: The constructor allows us to initialize a Book object with its essential attributes when it's created. This encapsulates the process of creating a book and ensures that it's always in a valid state.

-Abstraction of Behavior: The “DisplayInfo” method abstracts the behavior of displaying information about the book. Instead of exposing individual attributes, this method provides a simple way to retrieve and display all the essential book details in one go. This encapsulates the details of how the book information is presented.