CSE 335 Spring 2018: Project 1

Project Description:

Front-end developer John is creating a website for Reed's Pet Shop, but he needs back-end support to maintain and manipulate the collected data. John's website will work with a database of your design. During last Monday's meeting, both of you agreed on a set of Application Programming Interfaces (API) that is exposed from the *Pet Database,* so that he can work on his website while you are working on the database simultaneously.

Reed's Pet Shop sells *dogs, cats, fish* and *birds*. Each *Pet* has attributes *name, type, weight* and *price*. For *dogs*, a breed *category* characteristic determines whether the *dog* is a hound, herding, sporting, companion, etc. (string). For *birds*, the customer is provided with *nocturnality*, whether the *bird* is active at night (Boolean). For *fish*, the customer needs to know whether the *fish* is freshwater fish, saltwater fish, or it can thrive in any environment (string). For *cats*, the customer would like to know whether the *cat* is *fluffy* (Boolean).

Part of John's website is an online ordering system. Therefore, you need to implement databases that allow users to access pet information sorted by *name, type, weight*, and *price*, alphabetically or numerically depending on the type of the attribute. Furthermore, the sorting can be done in both ascending and descending order. You also need to implement databases searchable by pet's *name, type, weight* and *price.* In total you will need 8 databases, of which 4 will be *searchable databases* and 4 will be *sortable databases*.

John also needs the following access to get basic information about each *pet*.

1. GetName function which returns a string.
2. GetType function which returns a string.
3. GetWeight function which returns an unsigned integer.
4. GetPrice function which returns a double.
5. Print function that outputs basic pet information and special attributes.

The project implementation asks you to apply your knowledge about the Abstract Factory Pattern and the Template Method Pattern. Your code should sort the database using the *Bubble Sort* algorithm incorporating the Template Method Pattern. Your code should search using the *Binary Search* algorithm. Note that the *Binary Search* algorithm requires that the input is sorted in ascending order.

Coding Requirements:

1. You should have correct abstraction of classes that separates data and algorithms.
2. Draw a UML diagram.
3. You cannot change the main.cpp file provided to you. Your program MUST compile and run with the main.cpp. Your output should match the sample output. Your output should be properly indented as shown in the sample output.
4. Implement your code such that it follows proper privacy and give clients only the interfaces they need. Clients should not access data members directly.
5. Your program should not have memory leaks.
6. Provide *Get* and *Set* functions for all necessary data members.
7. For all member function that do not change values of member variable should be constant. For all calls by reference, if it does not make changes to the variable passed by reference then they should refer to const.
8. Each class should be either defined and implemented in one header file or defined in a header file and implement in a cpp file. No two classes should be defined or implemented in one file.

Submission Guidelines:

1. Work in teams of two to design the UML and implement the project.
2. You must have received an email about your team member. You are not allowed to change teammate. If you have issues or concerns about your project team, email TA Salman Ali at alisalm1@msu.edu ASAP.
3. Each team must meet at least TWO times. For each meeting, you need to fill a Team Meeting Report in detail. If your teammate does not respond or participate in your project meeting, then you need to include email proof along with your submission.
4. Each team must submit a UML along with the project code and team meeting reports.
5. You must submit a *zip* file that contain UML, team participation report and one directory:

    (a) A UML diagram (PDF document) including:

        i.   NetID of each group member,
        ii. Full name of each group member

    (b) Each team submits TWO meeting reports in their project submission.

    (c) The whole Netbeans project directory. You need to ensure that NetBeans can open your project, compile and run. Your project will not be graded if it does not compile.

6. This project is due via Handin (https://secure.cse.msu.edu/handin/) by 11:59 PM on 02/25/2018.

Project Output:

```
*********************** Before Sorting
Name:    Archie1 Type:    Parrot    Weight:    5    Price:    99.99    Nocturnal:   true
Name:    Archie2 Type:    Owl       Weight:    6    Price:    70.00    Nocturnal:   false
Name:    Archie3 Type:    Penguin   Weight:    9    Price:    49.99    Nocturnal:   true
Name:    Maggie1 Type:    Labrador  Weight:    70   Price:    1000.00  Category:    Hound
Name:    Maggie2 Type:    Beagle    Weight:    50   Price:    499.99   Category:    Sport
Name:    Maggie3 Type:    Bulldog   Weight:    60   Price:    799.99   Category:    Companion
Name:    Casper1 Type:    Cod       Weight:    1    Price:    10.99    WaterType:   Saltwater
Name:    Casper2 Type:    Catfish   Weight:    2    Price:    9.99     WaterType:   FreshWater
Name:    Casper3 Type:    Herring   Weight:    1    Price:    12.00    WaterType:   AnyWater
Name:    Smokey1 Type:    Siamese   Weight:    30   Price:    200.00   Fluffy:      false
Name:    Smokey2 Type:    Persian   Weight:    45   Price:    299.99   Fluffy:      true
Name:    Smokey3 Type:    British   Weight:    28   Price:    250.50   Fluffy:      true
*********************** After Sorting By Name Descending
Name:    Smokey3 Type:    British   Weight:    28   Price:    250.50   Fluffy:      true
Name:    Smokey2 Type:    Persian   Weight:    45   Price:    299.99   Fluffy:      true
Name:    Smokey1 Type:    Siamese   Weight:    30   Price:    200.00   Fluffy:      false
Name:    Maggie3 Type:    Bulldog   Weight:    60   Price:    799.99   Category:    Companion
Name:    Maggie2 Type:    Beagle    Weight:    50   Price:    499.99   Category:    Sport
Name:    Maggie1 Type:    Labrador  Weight:    70   Price:    1000.00  Category:    Hound
Name:    Casper3 Type:    Herring   Weight:    1    Price:    12.00    WaterType:   AnyWater
Name:    Casper2 Type:    Catfish   Weight:    2    Price:    9.99     WaterType:   FreshWater
Name:    Casper1 Type:    Cod       Weight:    1    Price:    10.99    WaterType:   Saltwater
Name:    Archie3 Type:    Penguin   Weight:    9    Price:    49.99    Nocturnal:   true
Name:    Archie2 Type:    Owl       Weight:    6    Price:    70.00    Nocturnal:   false
Name:    Archie1 Type:    Parrot    Weight:    5    Price:    99.99    Nocturnal:   true
*********************** After Sorting By Name Ascending
Name:    Archie1 Type:    Parrot    Weight:    5    Price:    99.99    Nocturnal:   true
Name:    Archie2 Type:    Owl       Weight:    6    Price:    70.00    Nocturnal:   false
Name:    Archie3 Type:    Penguin   Weight:    9    Price:    49.99    Nocturnal:   true
Name:    Casper1 Type:    Cod       Weight:    1    Price:    10.99    WaterType:   Saltwater
Name:    Casper2 Type:    Catfish   Weight:    2    Price:    9.99     WaterType:   FreshWater
Name:    Casper3 Type:    Herring   Weight:    1    Price:    12.00    WaterType:   AnyWater
Name:    Maggie1 Type:    Labrador  Weight:    70   Price:    1000.00  Category:    Hound
Name:    Maggie2 Type:    Beagle    Weight:    50   Price:    499.99   Category:    Sport
Name:    Maggie3 Type:    Bulldog   Weight:    60   Price:    799.99   Category:    Companion
Name:    Smokey1 Type:    Siamese   Weight:    30   Price:    200.00   Fluffy:      false
Name:    Smokey2 Type:    Persian   Weight:    45   Price:    299.99   Fluffy:      true
Name:    Smokey3 Type:    British   Weight:    28   Price:    250.50   Fluffy:      true
*********************** After Sorting By Type Descending
Name:    Smokey1 Type:    Siamese   Weight:    30   Price:    200.00   Fluffy:      false
Name:    Smokey2 Type:    Persian   Weight:    45   Price:    299.99   Fluffy:      true
Name:    Archie3 Type:    Penguin   Weight:    9    Price:    49.99    Nocturnal:   true
Name:    Archie1 Type:    Parrot    Weight:    5    Price:    99.99    Nocturnal:   true
Name:    Archie2 Type:    Owl       Weight:    6    Price:    70.00    Nocturnal:   false
Name:    Maggie1 Type:    Labrador  Weight:    70   Price:    1000.00  Category:    Hound
Name:    Casper3 Type:    Herring   Weight:    1    Price:    12.00    WaterType:   AnyWater
Name:    Casper1 Type:    Cod       Weight:    1    Price:    10.99    WaterType:   Saltwater
Name:    Casper2 Type:    Catfish   Weight:    2    Price:    9.99     WaterType:   FreshWater
Name:    Maggie3 Type:    Bulldog   Weight:    60   Price:    799.99   Category:    Companion
Name:    Smokey3 Type:    British   Weight:    28   Price:    250.50   Fluffy:      true
Name:    Maggie2 Type:    Beagle    Weight:    50   Price:    499.99   Category:    Sport
*********************** After Sorting By Type Ascending
Name:    Maggie2 Type:    Beagle    Weight:    50   Price:    499.99   Category:    Sport
Name:    Smokey3 Type:    British   Weight:    28   Price:    250.50   Fluffy:      true
Name:    Maggie3 Type:    Bulldog   Weight:    60   Price:    799.99   Category:    Companion
Name:    Casper2 Type:    Catfish   Weight:    2    Price:    9.99     WaterType:   FreshWater
Name:    Casper1 Type:    Cod       Weight:    1    Price:    10.99    WaterType:   Saltwater
Name:    Casper3 Type:    Herring   Weight:    1    Price:    12.00    WaterType:   AnyWater
Name:    Maggie1 Type:    Labrador  Weight:    70   Price:    1000.00  Category:    Hound
Name:    Archie2 Type:    Owl       Weight:    6    Price:    70.00    Nocturnal:   false
Name:    Archie1 Type:    Parrot    Weight:    5    Price:    99.99    Nocturnal:   true
Name:    Archie3 Type:    Penguin   Weight:    9    Price:    49.99    Nocturnal:   true
Name:    Smokey2 Type:    Persian   Weight:    45   Price:    299.99   Fluffy:      true
Name:    Smokey1 Type:    Siamese   Weight:    30   Price:    200.00   Fluffy:      false
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*********************** After Sorting By Price Descending
Name:    Maggie1 Type:    Labrador  Weight:   70  Price:    1000.00 Category:   Hound
Name:    Maggie3 Type:    Bulldog   Weight:   60  Price:     799.99 Category:   Companion
Name:    Maggie2 Type:    Beagle    Weight:   50  Price:     499.99 Category:   Sport
Name:    Smokey2 Type:    Persian   Weight:   45  Price:     299.99 Fluffy:     true
Name:    Smokey3 Type:    British   Weight:   28  Price:     250.50 Fluffy:     true
Name:    Smokey1 Type:    Siamese   Weight:   30  Price:     200.00 Fluffy:     false
Name:    Archie1 Type:    Parrot    Weight:   5   Price:      99.99 Nocturnal:  true
Name:    Archie2 Type:    Owl       Weight:   6   Price:      70.00 Nocturnal:  false
Name:    Archie3 Type:    Penguin   Weight:   9   Price:      49.99 Nocturnal:  true
Name:    Casper3 Type:    Herring   Weight:   1   Price:      12.00 WaterType:  AnyWater
Name:    Casper1 Type:    Cod       Weight:   1   Price:      10.99 WaterType:  Saltwater
Name:    Casper2 Type:    Catfish   Weight:   2   Price:       9.99 WaterType:  FreshWater
*********************** After Sorting By Price Ascending
Name:    Casper2 Type:    Catfish   Weight:   2   Price:       9.99 WaterType:  FreshWater
Name:    Casper1 Type:    Cod       Weight:   1   Price:      10.99 WaterType:  Saltwater
Name:    Casper3 Type:    Herring   Weight:   1   Price:      12.00 WaterType:  AnyWater
Name:    Archie3 Type:    Penguin   Weight:   9   Price:      49.99 Nocturnal:  true
Name:    Archie2 Type:    Owl       Weight:   6   Price:      70.00 Nocturnal:  false
Name:    Archie1 Type:    Parrot    Weight:   5   Price:      99.99 Nocturnal:  true
Name:    Smokey1 Type:    Siamese   Weight:   30  Price:     200.00 Fluffy:     false
Name:    Smokey3 Type:    British   Weight:   28  Price:     250.50 Fluffy:     true
Name:    Smokey2 Type:    Persian   Weight:   45  Price:     299.99 Fluffy:     true
Name:    Maggie2 Type:    Beagle    Weight:   50  Price:     499.99 Category:   Sport
Name:    Maggie3 Type:    Bulldog   Weight:   60  Price:     799.99 Category:   Companion
Name:    Maggie1 Type:    Labrador  Weight:   70  Price:    1000.00 Category:   Hound


*********************** After Sorting By Weight Descending
Name:    Maggie1 Type:    Labrador  Weight:   70  Price:    1000.00 Category:   Hound
Name:    Maggie3 Type:    Bulldog   Weight:   60  Price:     799.99 Category:   Companion
Name:    Maggie2 Type:    Beagle    Weight:   50  Price:     499.99 Category:   Sport
Name:    Smokey2 Type:    Persian   Weight:   45  Price:     299.99 Fluffy:     true
Name:    Smokey1 Type:    Siamese   Weight:   30  Price:     200.00 Fluffy:     false
Name:    Smokey3 Type:    British   Weight:   28  Price:     250.50 Fluffy:     true
Name:    Archie3 Type:    Penguin   Weight:   9   Price:      49.99 Nocturnal:  true
Name:    Archie2 Type:    Owl       Weight:   6   Price:      70.00 Nocturnal:  false
Name:    Archie1 Type:    Parrot    Weight:   5   Price:      99.99 Nocturnal:  true
Name:    Casper2 Type:    Catfish   Weight:   2   Price:       9.99 WaterType:  FreshWater
Name:    Casper1 Type:    Cod       Weight:   1   Price:      10.99 WaterType:  Saltwater
Name:    Casper3 Type:    Herring   Weight:   1   Price:      12.00 WaterType:  AnyWater
*********************** After Sorting By Weight Ascending
Name:    Casper3 Type:    Herring   Weight:   1   Price:      12.00 WaterType:  AnyWater
Name:    Casper1 Type:    Cod       Weight:   1   Price:      10.99 WaterType:  Saltwater
Name:    Casper2 Type:    Catfish   Weight:   2   Price:       9.99 WaterType:  FreshWater
Name:    Archie1 Type:    Parrot    Weight:   5   Price:      99.99 Nocturnal:  true
Name:    Archie2 Type:    Owl       Weight:   6   Price:      70.00 Nocturnal:  false
Name:    Archie3 Type:    Penguin   Weight:   9   Price:      49.99 Nocturnal:  true
Name:    Smokey3 Type:    British   Weight:   28  Price:     250.50 Fluffy:     true
Name:    Smokey1 Type:    Siamese   Weight:   30  Price:     200.00 Fluffy:     false
Name:    Smokey2 Type:    Persian   Weight:   45  Price:     299.99 Fluffy:     true
Name:    Maggie2 Type:    Beagle    Weight:   50  Price:     499.99 Category:   Sport
Name:    Maggie3 Type:    Bulldog   Weight:   60  Price:     799.99 Category:   Companion
Name:    Maggie1 Type:    Labrador  Weight:   70  Price:    1000.00 Category:   Hound
*********************** Searching for Name Casper3 ...
Name:    Casper3 Type:    Herring   Weight:   1   Price:      12.00   WaterType:  AnyWater
*********************** Searching for Type Penguin ...
Name:    Archie3 Type:    Penguin   Weight:   9   Price:      49.99 Nocturnal:  true
*********************** Searching by Price $99.99 ...
Name:    Archie1 Type:    Parrot    Weight:   5   Price:      99.99 Nocturnal:  true
*********************** Searching by Weight 2 lbs...
Name:    Casper2 Type:    Catfish   Weight:   2   Price:       9.99   WaterType:  FreshWater
*********************** Searching for Name Charlie ...
Charlie not found.
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