

## **ProgramowanieObiektowe: Zadanie #1**

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**Data: 20.05.2023**

## Rozdział 5: Zadania do zrealizowania.

### Dodanie ustawień dotyczących kolorystyki poszczególnych ekranów

Dla dodania ustawień kolorystyka, wykorzystałem takie są klasy i interfejsy:

#### 1. Interfejs ISettings:

```
using SampleHierarchies.Enums;
using Newtonsoft.Json;

namespace SampleHierarchies.Interfaces.Data;

/// <summary>
/// Settings interface.
/// </summary>
public interface ISettings
{
    #region Interface Members

    /// <summary>
    /// Version of settings.
    /// </summary>
    public string Version { get; set; }

    /// <summary>
    /// Color of display
    /// </summary>
    public string? ScreenColor { get; set; }

    /// <summary>
    /// Method that helps us to read display color settings from json file
    /// </summary>
    /// <typeparam name="T"></typeparam>
    /// <param name="propertyName"></param>
    /// <param name="defaultValue"></param>
    /// <returns></returns>
    T ReadValue<T>(string propertyName, T defaultValue);

    #endregion // Interface Members
}
```

#### 2. Klasa Settings:

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using Newtonsoft.Json;
using Newtonsoft.Json.Linq;
using SampleHierarchies.Interfaces.Data;

namespace SampleHierarchies.Data
{
    public class Settings : ISettings
    {
        #region Ctor and Properties

        public string Version { get => throw new NotImplementedException(); set => throw new NotImplementedException(); }

        public string? ScreenColor { get; set; }

        public static string? FilePath { get; set; }

        static Settings()
        {
            FilePath = "settings.json";
        }

        #endregion

        #region Public Methods
    }
}
```

```

/// <summary>
/// The method that allows to take a color from settings.json file
/// </summary>
/// <typeparam name="T"></typeparam>
/// <param name="propertyName"></param>
/// <param name="defaultValue"></param>
/// <returns></returns>
0 references
public T ReadValue<T>(string propertyName, T defaultValue)
{
    try
    {
        if (File.Exists(filePath))
        {
            string json = File.ReadAllText(filePath);
            dynamic jsonObject = JObject.Parse(json);
            if (jsonObject is not null && jsonObject[propertyName] is not null)
            {
                JToken propertyValue = jsonObject[propertyName];
                if (propertyValue.Type != JTokenType.Null)
                {
                    if (propertyValue.ToObject<T>() != null)
                    {
                        T? result = propertyValue.ToObject<T>();
                        if (result is not null)
                        {
                            return result;
                        }
                    }
                }
            }
            return defaultValue;
        }
    }
    catch (Exception ex)
    {
        Console.WriteLine($"An error occurred while reading the JSON file: {ex.Message}");
    }
    return defaultValue;
}
#endregion

```

Do wszystkich metod i właściwości dodałem komentarzy.

Przykłady działania kodu:

```

Your available choices are:
0. Exit
1. Animals
2. Create a new settings
Please enter your choice: 1

Your available choices are:
0. Exit
1. Mammals
2. Save to file
3. Read from file
Please enter your choice: 1

Your available choices are:
0. Exit
1. Dogs
2. Polar Bears
3. Lions
4. Bottlenose Whales
Please enter your choice: 1

Your available choices are:
0. Exit
1. List all dogs
2. Create a new dog
3. Delete existing dog
4. Modify existing dog
Please enter your choice: _

```

Wszystkie ekrany mają inny kolor wyświetlania.

Wszystkie kolory wyświetlacza są zapisywane w pliku settings.json który wygląda tak:

```
settings.json X
C: > Users > Deellay > source > repos > src > SampleHierarchies.App > bin > Debug > net6.0 > {} settings.json > ...
1
2   "MainScreenColor": "Red",
3   "AnimalsScreenColor": "Magenta",
4   "MammalsScreenColor": "Yellow",
5   "DogsScreenColor": "Blue",
6   "PolarBearScreenColor": "Cyan",
7   "LionScreenColor": "Yellow",
8   "BottlenoseWhaleScreenColor": "Red"
9
```

Mamy również funkcję, która pozwala zmienić kolor jednego z ekranów:

```
C:\Users\Deellay\source\repos\src\SampleHierarchies.App\bin\Debug\net6.0\SampleHierarchies.App.exe
Your available choices are:
0. Exit
1. Animals
2. Create a new settings
Please enter your choice: 2
Enter the name of the property to edit:
MammalsScreenColor
Current value of 'MammalsScreenColor': Yellow
Enter the new value:
Green
Value of property 'MammalsScreenColor' updated successfully.

Your available choices are:
0. Exit
1. Animals
2. Create a new settings
Please enter your choice: 1

Your available choices are:
0. Exit
1. Mammals
2. Save to file
3. Read from file
Please enter your choice: 1

Your available choices are:
0. Exit
1. Dogs
2. Polar Bears
```

Jak widać, kolor ekranu Ssaki zmienił się z żółtego na zielony. Plik settings.json również zmienił swoją wartość.

```
settings.json X
C: > Users > Deellay > source > repos > src > SampleHierarchies.App > bin > Debug > net6.0 > {} sett
1   {
2     "MainScreenColor": "Red",
3     "AnimalsScreenColor": "Magenta",
4     "MammalsScreenColor": "Green",
5     "DogsScreenColor": "Blue",
6     "PolarBearScreenColor": "Cyan",
7     "LionScreenColor": "Yellow",
8     "BottlenoseWhaleScreenColor": "Red"
9   }
```

**Dodać struktur danych, interfejsy, zmodyfikować odpowiednie serwisu oraz dodać nowy ekran opisujący jeden z poniższych rodzajów zwierząt. Wybrać jeden**

z gatunków. Zapisać do pliku wszystkie wskazane jednostki ze wskazanymi właściwościami. Podać w wyniku plik JSON po zapisie danych.

Pierwszym zwierzęciem, które dodałem oprócz Dog, był PolarBear. Aby dodać nowe zwierzę, użyłem następujących klas i interfejsów:

1. Interfejs IPolarBear:

```
namespace SampleHierarchies.Interfaces.Data.Mammals
{
    4 references
    public interface IPolarBear : IMammal
    {
        #region Interface Members
        /// <summary>
        /// Kind of Bear
        /// </summary>
        3 references
        public string KindOf { get; set; }
        /// <summary>
        /// Type of fur
        /// </summary>
        3 references
        public string TypeOfFur { get; set; }
        /// <summary>
        /// Large of Paws
        /// </summary>
        3 references
        public string LargePaws { get; set; }
        /// <summary>
        /// Type of diet
        /// </summary>
        3 references
        public string TypeOfDiet { get; set; }
        /// <summary>
        /// Is Semi-aquatic
        /// </summary>
        2 references
        public bool IsSemiAquatic { get; set; }
        /// <summary>
        /// Describe of Semi-Aquatic
        /// </summary>
        3 references
        public string SemiAquaticDescribe { get; set; }
        /// <summary>
        /// DescribeOfSenseOfSmell
        /// </summary>
        3 references
        public string ExcellentSenseOfSmell { get; set; }

        #endregion
    }
}
```

2. Klasa PolarBear:

```
namespace SampleHierarchies.Data.Mammals
{
    11 references
    public class PolarBear : MammalBase, IPolarBear
    {
        #region Public Methods
        /// <summary>
        /// Override void Display()
        /// </summary>
        public override void Display()
        {
            Console.WriteLine($"My name is: {Name}, my age is: {Age}, I have {TypeOfFur} fur and I am a {KindOf} bear, " +
                $"My paws size is: {LargePaws}, My diet is: {TypeOfDiet}, Semi-Aquatic: {SemiAquaticDescribe}, Sense of smell: {ExcellentSenseOfSmell}");
        }
        #endregion

        #region ctor and Properties
        [jsonname]
        public string KindOf { get; set; }
        [jsonname]
        public string TypeOfFur { get; set; }
        [jsonname]
        public string LargePaws { get; set; }
        [jsonname]
        public string TypeOfDiet { get; set; }
        [jsonname]
        public bool IsSemiAquatic { get; set; }
        [jsonname]
        public string SemiAquaticDescribe { get; set; }
        [jsonname]
        public string ExcellentSenseOfSmell { get; set; }

        [jsonname]
        public PolarBear(string name, int age, string kindOf, string typeOfFur, string largePaws, string typeOfDiet, bool isSemiAquatic, string semiAquaticDescribe, string excellentSenseOfSmell) : base(name, age, MammalSpecies.PolarBear)
        {
            KindOf = kindOf;
            TypeOfFur = typeOfFur;
            LargePaws = largePaws;
            TypeOfDiet = typeOfDiet;
            IsSemiAquatic = isSemiAquatic;
            SemiAquaticDescribe = semiAquaticDescribe;
            ExcellentSenseOfSmell = excellentSenseOfSmell;
        }
        #endregion
    }
}
```

Zmieniłem również enum MammalSpecies, aby dodać do niego nowe zwierzęta:

```

using System.ComponentModel;
/// <summary>
/// Dummy enum.
/// </summary>
8 references
public enum MammalSpecies
{
    [Description("Simple description of a none")]
    None = 0,
    [Description("Simple description of a dog")]
    Dog = 1,
    [Description("Simple description of a cat")]
    Cat = 2,
    [Description("Simple description of a polar bear")]
    PolarBear = 3,
    [Description("Simple description of a lion")]
    Lion = 4,
    [Description("Simple description of a bootlenose whale")]
    BottlenoseWhale = 5,
}

```

### 3. PolarBearScreen:

```

namespace SampleHierarchies.Gui
{
    5 references
    public class PolarBearScreen : Screen
    {
        #region Ctor and Properties
        /// <summary>
        /// Properties
        /// </summary>
        private IDataService _dataService;
        private ISettings _settings;
        /// <summary>
        /// Ctor
        /// </summary>
        /// <param name="dataService"></param>
        6 references
        public PolarBearScreen(IDataService dataService, ISettings settings)
        {
            _dataService = dataService;
            _settings = settings;
        }

        #endregion

        #region Public Methods
        2 references
        public override void Show()
        {
            while (true)
            {
                _settings = new Settings();
                _settings.ScreenColor = _settings.ReadValue("PolarBearScreenColor", "White");
                Console.ForegroundColor = (ConsoleColor)Enum.Parse(typeof(ConsoleColor), _settings.ScreenColor);

                Console.WriteLine();
                Console.WriteLine("Your available choices are:");
                Console.WriteLine("0. Exit");
                Console.WriteLine("1. List all polar bears");
                Console.WriteLine("2. Create a new polar bear");
                Console.WriteLine("3. Delete existing polar bear");
                Console.WriteLine("4. Modify existing polar bear");
                Console.WriteLine("Please enter your choice: ");

                string? menuChoiceAsString = Console.ReadLine();
                try
                {
                    if (menuChoiceAsString is null)

```

```

                {
                    throw new ArgumentNullException(nameof(menuChoiceAsString));
                }

                PolarBearScreenChoices choice = (PolarBearScreenChoices)Int32.Parse(menuChoiceAsString);
                switch (choice)
                {
                    case PolarBearScreenChoices.List:
                        ListOfPolarBears();
                        break;
                    case PolarBearScreenChoices.Create:
                        AddPolarBear();
                        break;
                    case PolarBearScreenChoices.Delete:
                        DeletePolarBear();
                        break;
                    case PolarBearScreenChoices.Modify:
                        EditPolarBearRecent();
                        break;
                    case PolarBearScreenChoices.Exit:
                        Console.WriteLine("Returning to previous menu");
                        return;
                }
            }
        }
    }
}

```

```

1 reference
private void ListOfPolarBears()
{
    Console.WriteLine();
    if (_dataService?.Animals?.Mammals?.PolarBears is not null &&
        _dataService.Animals.Mammals.PolarBears.Count > 0)
    {
        Console.WriteLine("Here's a List of polar bears:");
        int i = 1;
        foreach (PolarBear bear in _dataService.Animals.Mammals.PolarBears)
        {
            Console.WriteLine($"Bear number {i}, ");
            bear.Display();
            i++;
        }
    }
    else
    {
        Console.WriteLine("The list of polar bears is empty.");
    }
}

1 reference
private void DeletePolarBear()
{
    try
    {
        Console.WriteLine("What is the name of the bear you want to delete? ");
        string? name = Console.ReadLine();
        if (name is null)
        {
            throw new ArgumentNullException(nameof(name));
        }
        PolarBear? bear = (_dataService?.Animals?.Mammals?.PolarBears
            ?.FirstOrDefault(pb => pb is not null && string.Equals(pb.Name, name)));
        if (bear is not null)
        {
            _dataService?.Animals?.Mammals?.PolarBears?.Remove(bear);
            Console.WriteLine("Polar bear with name: {0} has been deleted from a list of polar bears", bear.Name);
        }
        else
        {
            Console.WriteLine("Polar bear not found.");
        }
    }
    catch
    {
        Console.WriteLine("Invalid input.");
    }
}

```

```

/// <summary>
/// Edit a recent bear that we create
/// </summary>
1 reference
private void EditPolarBearRecent()
{
    try
    {
        Console.WriteLine("What is the name of the polar bear you want to edit? ");
        string? name = Console.ReadLine();
        if (name is null)
        {
            throw new ArgumentNullException(nameof(name));
        }
        PolarBear? bear = (_dataService?.Animals?.Mammals?.PolarBears
            ?.FirstOrDefault(pb => pb is not null && string.Equals(pb.Name, name)));
        if (bear is not null)
        {
            PolarBear editedPolarBear = AddEditPolarBear();
            bear.Copy(editedPolarBear);
            Console.WriteLine("Bear after edit: ");
            bear.Display();
        }
        else
        {
            Console.WriteLine("Dog not found.");
        }
    }
    catch
    {
        Console.WriteLine("Invalid input. Try again.");
    }
}

/// <summary>
/// Add a polar bear to the list of bears
/// </summary>
1 reference
private void AddPolarBear()
{
    try
    {
        PolarBear bear = AddEditPolarBear();
        _dataService?.Animals?.Mammals?.PolarBears?.Add(bear);
        Console.WriteLine("Polar bear with name: {0} has been added to a list of polar bears", bear.Name);
    }
    catch
    {
        Console.WriteLine("Invalid input. Try again.");
    }
}

```

```

/// <summary>
/// Add and editing of existing polar bears
/// </summary>
/// <returns></returns>
/// <exception cref="ArgumentNullException"></exception>

```

```

private PolarBear AddEditPolarBear()
{
    bool isSemiAquatic = false;
    string? semiAquaticDescription = "Nothing";
    Console.WriteLine("What name of the bear? ");
    string? name = Console.ReadLine();
    Console.WriteLine("What is the bear's age? ");
    string? ageAsString = Console.ReadLine();
    Console.WriteLine("What is the bear's kind of? ");
    string? kindOf = Console.ReadLine();
    Console.WriteLine("What is the type of bear's fur? ");
    string? typeOfFur = Console.ReadLine();
    Console.WriteLine("What is the size of bear's paws? ");
    string? largeOfPaws = Console.ReadLine();
    Console.WriteLine("What is the type of bear's diet? ");
    string? typeOfDiet = Console.ReadLine();
    Console.WriteLine("Is the bear semi-aquatic? ");
    string? IsSemiAquaticAsString = Console.ReadLine();
    switch(IsSemiAquaticAsString)
    {
        case "Yes":
            isSemiAquatic = true;
            Console.WriteLine("What is the bear description of swimming? ");
            semiAquaticDescription = Console.ReadLine();
            break;
        case "No":
            isSemiAquatic = false;
            break;
        default:
            Console.WriteLine("Invalid input");
            break;
    }
    Console.WriteLine("How good is his scent? ");
    string? excellentSenseOfSmell = Console.ReadLine();

    if (name is null)
    {
        throw new ArgumentNullException(nameof(name));
    }
}

```

```

}
Console.WriteLine("How good is his scent? ");
string? excellentSenseOfSmell = Console.ReadLine();
if (name is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (ageAsString is null)
{
    throw new ArgumentNullException(nameof(ageAsString));
}
if (kindOf is null)
{
    throw new ArgumentNullException(nameof(kindOf));
}
if (typeOfFur is null)
{
    throw new ArgumentNullException(nameof(typeOfFur));
}
if (largeOfPaws is null)
{
    throw new ArgumentNullException(nameof(largeOfPaws));
}
if (typeOfDiet is null)
{
    throw new ArgumentNullException(nameof(typeOfDiet));
}
if (IsSemiAquaticAsString is null)
{
    throw new ArgumentNullException(nameof(IsSemiAquaticAsString));
}
if (semiAquaticDescription is null)
{
    throw new ArgumentNullException(nameof(semiAquaticDescription));
}
if (excellentSenseOfSmell is null)
{
    throw new ArgumentNullException(nameof(excellentSenseOfSmell));
}
int age = Int32.Parse(ageAsString);
PolarBear bear = new PolarBear(name, age, kindOf, typeOfFur, largeOfPaws, typeOfDiet, isSemiAquatic, semiAquaticDescription, excellentSenseOfSmell);
return bear;
}

```

Również w tej klasie użyłem enum `PolarBearScreenChoices` i zmodyfikowałem klasę `IMammals` i `Mammals`, gdzie wcześniej dodałem `List<IPolarBear> PolarBears`



```

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

namespace SampleHierarchies.Enums
{
    7 references
    public enum PolarBearScreenChoices
    {
        Exit = 0,
        List = 1,
        Create = 2,
        Delete = 3,
        Modify = 4,
    }
}

```

```

2
3 namespace SampleHierarchies.Interfaces.Data;
4
5 /// <summary>
6 /// Mammals collection.
7 /// </summary>
8 3 references
9 public interface IMammals
10 {
11     #region Interface Members
12     /// <summary>
13     /// Dogs collection.
14     /// </summary>
15     9 references
16     List<IDog> Dogs { get; set; }
17     /// <summary>
18     /// Polar Bears collection
19     /// </summary>
20     9 references
21     List<IPolarBear> PolarBears { get; set; }
22     /// <summary>
23     /// Lions collection
24     /// </summary>
25     9 references
26     List<ILion> Lions { get; set; }
27     /// <summary>
28     /// Bottlenose whales collection
29     /// </summary>
30     9 references
31     List<IBottlenoseWhale> BottlenoseWhales { get; set; }
32     #endregion // Interface Members
33 }

```

```

using SampleHierarchies.Interfaces.Data;
using SampleHierarchies.Interfaces.Data.Mammals;

namespace SampleHierarchies.Data.Mammals;

/// <summary>
/// Mammals collection.
/// </summary>

public class Mammals : IMammals
{
    #region IMammals Implementation

    /// <inheritdoc>

    public List<IDog> Dogs { get; set; }

    9 references
    public List<IPolarBear> PolarBears { get; set; }

    9 references
    public List<ILion> Lions { get; set; }

    9 references
    public List<IBottlenoseWhale> BottlenoseWhales { get; set; }

    #endregion // IMammals Implementation

    #region Ctors

    /// <summary>
    /// Default ctor.
    /// </summary>
    1 reference
    public Mammals()
    {
        Dogs = new List<IDog>();
        PolarBears = new List<IPolarBear>();
        Lions = new List<ILion>();
        BottlenoseWhales = new List<IBottlenoseWhale>();
    }

    #endregion // Ctors
}

```

Dodatkowo, zmodyfikowałem klasę MammalsScreen, aby zawierała wszystkie kolejne stworzone przeze mnie zwierzęta: PolarBear, Lion, Bottlenose Whale:

```

1 using SampleHierarchies.Data;
2 using SampleHierarchies.Enums;
3 using SampleHierarchies.Interfaces.Data;
4 using SampleHierarchies.Interfaces.Services;
5
6 namespace SampleHierarchies.Gui;
7
8 /// <summary>
9 /// Mammals main screen.
10 /// </summary>
11 9 references
12 public sealed class MammalsScreen : Screen
13 {
14     #region Properties And Ctor
15
16     /// <summary>
17     /// Animals screen.
18     /// </summary>
19     private DogsScreen _dogsScreen;
20     private PolarBearScreen _polarBearScreen;
21     private LionScreen _lionScreen;
22     private BottlenoseWhaleScreen _bottlenoseWhaleScreen;
23     private ISettings _settings;
24
25     /// <summary>
26     /// Ctor.
27     /// </summary>
28     /// <param name="dataService">Data service reference</param>
29     /// <param name="dogsScreen">Dogs screen</param>
30     9 reference
31     public MammalsScreen(DogsScreen dogsScreen, PolarBearScreen polarBearScreen, LionScreen lionScreen, BottlenoseWhaleScreen bottlenoseWhaleScreen, ISettings settings)
32     {
33         _dogsScreen = dogsScreen;
34         _polarBearScreen = polarBearScreen;
35         _lionScreen = lionScreen;
36         _bottlenoseWhaleScreen = bottlenoseWhaleScreen;
37         _settings = settings;
38     }
39
40     #endregion Properties And Ctor
41
42     #region Public Methods
43
44
45
46
47
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50
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52
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54
55
56
57
58
59
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100

```

```

2 references
public override void Show()
{
    while (true)
    {
        _settings = new Settings();
        _settings.ScreenColor = _settings.ReadValue("MammalsScreenColor", "White");
        Console.ForegroundColor = (ConsoleColor)Enum.Parse(typeof(ConsoleColor), _settings.ScreenColor);

        Console.WriteLine();
        Console.WriteLine("Your available choices are:");
        Console.WriteLine("0. Exit");
        Console.WriteLine("1. Dogs");
        Console.WriteLine("2. Polar Bears");
        Console.WriteLine("3. Lions");
        Console.WriteLine("4. Bottlenose Whales");
        Console.Write("Please enter your choice: ");

        string? choiceAsString = Console.ReadLine();

        // Validate choice
        try
        {
            if (choiceAsString is null)
            {
                throw new ArgumentNullException(nameof(choiceAsString));
            }

            MammalsScreenChoices choice = (MammalsScreenChoices)int32.Parse(choiceAsString);
            switch (choice)
            {
                case MammalsScreenChoices.Dogs:
                    _dogsScreen.Show();
                    break;
                case MammalsScreenChoices.PolarBears:
                    _polarBearScreen.Show();
                    break;
                case MammalsScreenChoices.Lions:
                    _lionScreen.Show();
                    break;
                case MammalsScreenChoices.Whales:
                    _bottlenoseWhaleScreen.Show();
                    break;
                case MammalsScreenChoices.Exit:
                    Console.WriteLine("Going back to parent menu.");
                    return;
            }
        }
        catch { }
    }
}

```

Zmieniony enum MammalsScreenChoices:

```

1 namespace SampleHierarchies.Enums;
2
3 /// <summary>
4 /// Mammals screen choices.
5 /// </summary>
6 7 references
7 public enum MammalsScreenChoices
8 {
9     Exit = 0,
10    Dogs = 1,
11    PolarBears = 2,
12    Lions = 3,
13    Whales = 4,
14 }

```

Drugim zwierzęciem, które dodałem oprócz PolarBear, był Lion. Aby dodać nowe zwierzę, użyłem następujących klas i interfejsów:

1. Interfejs ILion:

```

namespace SampleHierarchies.Interfaces.Data.Mammals
{
    4 references
    public interface ILion : IMammal
    {
        #region Interface Members
        /// <summary>
        /// Is the lion the apex predator
        /// </summary>
        2 references
        public bool IsApexPredator { get; set; }
        /// <summary>
        /// Description of lion apex predator
        /// </summary>
        3 references
        public string? ApexPredatorDescribe { get; set; }
        /// <summary>
        /// Is the lion a puck hunter
        /// </summary>
        2 references
        public bool IsPuckHunter { get; set; }
        /// <summary>
        /// Description of lion puck hunting
        /// </summary>
        3 references
        public string? PuckHunterDescribe { get; set; }
        /// <summary>
        /// Description of lion mane
        /// </summary>
        3 references
        public string? Mane { get; set; }
        /// <summary>
        /// Is lion communicate with roaring
        /// </summary>
        2 references
        public bool IsRoaringCommunication { get; set; }
        /// <summary>
        /// Describe of lion roar communicate
        /// </summary>
        3 references
        public string? RoaringCommunicationDescribe { get; set; }
        /// <summary>
        /// Is lion defense his territory
        /// </summary>
        2 references
        public bool IsTerritoryDefense { get; set; }
        /// <summary>
        /// Description of how lion defense his territory
        /// </summary>
        3 references
        public string? TerritoryDefenseDescribe { get; set; }
        #endregion
    }
}

```

## 2. Klasa Lion:

```

namespace SampleHierarchies.Data.Mammals
{
    41 references
    public class Lion : MammalBase, ILion
    {
        #region Public Methods
        public override void Display()
        {
            Console.WriteLine($"My name is: {Name}, my age is: {Age}, Apex Predator: {ApexPredatorDescribe}, Puck Hunter: {PuckHunterDescribe}, * * *
            * {Mane} {Name}, Roaring Communication: {RoaringCommunicationDescribe}, Territory Defense: {TerritoryDefenseDescribe}");
        }
        #endregion

        #region Ctor and Properties
        2 references
        public bool IsApexPredator { get; set; }
        3 references
        public string? ApexPredatorDescribe { get; set; }
        2 references
        public bool IsPuckHunter { get; set; }
        3 references
        public string? PuckHunterDescribe { get; set; }
        3 references
        public string? Mane { get; set; }
        3 references
        public bool IsRoaringCommunication { get; set; }
        3 references
        public string? RoaringCommunicationDescribe { get; set; }
        3 references
        public bool IsTerritoryDefense { get; set; }
        3 references
        public string? TerritoryDefenseDescribe { get; set; }

        1 reference
        public Lion(string name, int age, bool isApexPredator, string? apexPredatorDescribe, bool isPuckHunter, string? puckHunterDescribe,
            string? mane, bool isRoaringCommunication, string? roaringCommunicationDescribe, bool isTerritoryDefense, string? territoryDefenseDescribe) : base(name, age, MammalSpecies.Lion)
        {
            IsApexPredator = isApexPredator;
            ApexPredatorDescribe = apexPredatorDescribe;
            IsPuckHunter = isPuckHunter;
            PuckHunterDescribe = puckHunterDescribe;
            Mane = mane;
            IsRoaringCommunication = isRoaringCommunication;
            RoaringCommunicationDescribe = roaringCommunicationDescribe;
            IsTerritoryDefense = isTerritoryDefense;
            TerritoryDefenseDescribe = territoryDefenseDescribe;
        }
        #endregion
    }
}

```

Zmieniłem również enum MammalSpecies, aby dodać do niego nowe zwierzęta:

```

using System.ComponentModel;

/// <summary>
/// Dummy enum.
/// </summary>
public enum MammalSpecies
{
    [Description("Simple description of a none")]
    None = 0,
    [Description("Simple description of a dog")]
    Dog = 1,
    [Description("Simple description of a cat")]
    Cat = 2,
    [Description("Simple description of a polar bear")]
    PolarBear = 3,
    [Description("Simple description of a lion")]
    Lion = 4,
    [Description("Simple description of a bootlenose whale")]
    BottlenoseWhale = 5,
}

```

### 3. Klasa LionScreen:

```

namespace SampleHierarchies.Gui
{
    5 references
    public class LionScreen : Screen
    {
        #region Ctor and Properties
        /// <summary>
        /// Data service of Lions
        /// </summary>
        private IDataService _dataService;
        private ISettings _settings;

        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="dataService"></param>
        0 references
        public LionScreen(IDataService dataService, ISettings settings)
        {
            _dataService = dataService;
            _settings = settings;
        }

        #endregion

        #region Public Methods
    }
}

```

```

#region Public Methods
2 references
public override void Show()
{
    while (true)
    {
        _settings = new Settings();
        _settings.ScreenColor = _settings.ReadValue("LionScreenColor", "White");
        Console.ForegroundColor = (ConsoleColor)Enum.Parse(typeof(ConsoleColor), _settings.ScreenColor);

        Console.WriteLine();
        Console.WriteLine("Your available choices are:");
        Console.WriteLine("0. Exit");
        Console.WriteLine("1. List all Lions");
        Console.WriteLine("2. Create a new Lion");
        Console.WriteLine("3. Delete existing Lion");
        Console.WriteLine("4. Modify existing Lion");
        Console.WriteLine("Please enter your choice: ");

        string? menuChoiceAsString = Console.ReadLine();

        try
        {
            if (menuChoiceAsString is null)
            {
                throw new ArgumentException(nameof(menuChoiceAsString));
            }

            LionScreenChoices choice = (LionScreenChoices)Int32.Parse(menuChoiceAsString);

            switch(choice)
            {
                case LionScreenChoices.List:
                    ListOfLions();
                    break;
                case LionScreenChoices.Create:
                    AddLion();
                    break;
                case LionScreenChoices.Delete:
                    DeleteLion();
                    break;
                case LionScreenChoices.Modify:
                    EditRecentLion();
                    break;
                case LionScreenChoices.Exit:
                    Console.WriteLine("Returning to previous menu");
                    return ;
            }
        }
        catch
        {
            Console.WriteLine("Invalid choice. Try again.");
        }
    }
}

```

```

/// <summary>
/// List of all lions
/// </summary>
1 reference
private void ListOfLions()
{
    Console.WriteLine();
    if (_dataService?.Animals?.Mammals?.Lions is not null &&
        _dataService.Animals.Mammals.Lions.Count > 0)
    {
        Console.WriteLine("Here's a list of lions:");
        int i = 1;
        foreach (Lion lion in _dataService.Animals.Mammals.Lions)
        {
            Console.WriteLine($"Lion number {i}, ");
            lion.Display();
            i++;
        }
    }
    else
    {
        Console.WriteLine("The list of lions is empty.");
    }
}

/// <summary>
/// Add new lion
/// </summary>
private void AddLion()
{
    try
    {
        Lion lion = AddEditLion();
        _dataService?.Animals?.Mammals?.Lions?.Add(lion);
        Console.WriteLine("Lion with name: {0} has been added to a list of lions", lion.Name);
    }
    catch
    {
        Console.WriteLine("Invalid input.");
    }
}

```

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```

/// <summary>
/// Add and edit lion from all lions (not current)
/// </summary>
/// <returns> returns
/// <exception cref="ArgumentNullException">exception

```

```

private Lion AddEditLion()
{
    bool IsApexPredator = false;
    bool IsPuckHunter = false;
    bool IsRoarCommunication = false;
    bool IsTerritoryDefense = false;
    string? ApexPredatorDescription = "Nothing";
    string? PuckHuntingDescription = "Nothing";
    string? RoaringCommunicationDescription = "Nothing";
    string? TerritoryDefenseDescription = "Nothing";
    Console.WriteLine("What is the name of lion? ");
    string? name = Console.ReadLine();
    Console.WriteLine("What is the age of lion? ");
    string? ageAsString = Console.ReadLine();
    Console.WriteLine("Is the lion apex predator? (Yes/No) ");
    string? IsApexPredatorAsString = Console.ReadLine();
    switch (IsApexPredatorAsString)
    {
        case "Yes":
            IsApexPredator = true;
            Console.WriteLine("Please, describe the apex predator ");
            ApexPredatorDescription = Console.ReadLine();
            break;
        case "No":
            IsApexPredator = false;
            break;
        default:
            Console.WriteLine("Invalid input");
            break;
    }
    Console.WriteLine("Does your lion hunt in packs? (Yes/No) ");
    string? IsPuckHunterAsString = Console.ReadLine();
    switch (IsPuckHunterAsString)
    {
        case "Yes":
            IsPuckHunter = true;
            Console.WriteLine("Please, describe the puck hunting of this lion ");
            PuckHuntingDescription = Console.ReadLine();
            break;
        case "No":
            IsPuckHunter = false;
            break;
        default:
            Console.WriteLine("Invalid input");
            break;
    }
    Console.WriteLine("What mane does your lion have? ");
    string? mane = Console.ReadLine();
    Console.WriteLine("Does your lion communicate with roar? (Yes/No) ");
    string? IsRoaringCommunicationAsString = Console.ReadLine();

```

```

        switch (IsRoaringCommunicationAsString)
        {
            case "Yes":
                IsRoarCommunication = true;
                Console.WriteLine("Please, describe the communication of your lion ");
                RoaringCommunicationDescription = Console.ReadLine();
                break;
            case "No":
                IsRoarCommunication = false;
                break;
            default:
                Console.WriteLine("Invalid input");
                break;
        }
    }
    Console.WriteLine("Does your lion defense his territory? (Yes/No) ");
    string? IsTerritoryDefenseAsString = Console.ReadLine();
    switch (IsTerritoryDefenseAsString)
    {
        case "Yes":
            IsTerritoryDefense = true;
            Console.WriteLine("Please, describe how your lion defense his territory ");
            TerritoryDefenseDescription = Console.ReadLine();
            break;
        case "No":
            IsTerritoryDefense = false;
            break;
        default:
            Console.WriteLine("Invalid input");
            break;
    }
}

let age = Int32.Parse(ageAsString);
Lion lion = new Lion(name, age, IsApexPredator, ApexPredatorDescription, IsPuckHunter,
    PuckHuntingDescription, mane, IsRoarCommunication, RoaringCommunicationDescription, IsTerritoryDefense, TerritoryDefenseDescription);
return lion;
}
}
}
}

```

Również w tej klasie użyłem enum LionScreenChoices i zmodyfikowałem klasę IMammals i Mammals, gdzie wcześniej dodałem List<ILion> Lions:

```

1 using System;
2 using System.Collections.Generic;
3 using System.Linq;
4 using System.Text;
5 using System.Threading.Tasks;
6
7 namespace SampleHierarchies.Enums
8 {
9     public enum LionScreenChoices
10     {
11         Exit = 0,
12         List = 1,
13         Create = 2,
14         Delete = 3,
15         Modify = 4,
16     }
17 }
18

```

```

2
3 namespace SampleHierarchies.Interfaces.Data;
4
5 /// <summary>
6 /// Mammals collection.
7 /// </summary>
8 public interface IMammals
9 {
10     #region Interface Members
11
12     /// <summary>
13     /// Dogs collection.
14     /// </summary>
15     List<IDog> Dogs { get; set; }
16
17     /// <summary>
18     /// Polar Bears collection
19     /// </summary>
20     List<IPolarBear> PolarBears { get; set; }
21
22     /// <summary>
23     /// Lions collection
24     /// </summary>
25     List<ILion> Lions { get; set; }
26
27     /// <summary>
28     /// Bottlenose whales collection
29     /// </summary>
30     List<IBottlenoseWhale> BottlenoseWhales { get; set; }
31
32     #endregion // Interface Members
33 }

```

```

using SampleHierarchies.Interfaces.Data;
using SampleHierarchies.Interfaces.Data.Mammals;

namespace SampleHierarchies.Data.Mammals;

/// <summary>
/// Mammals collection.
/// </summary>
public class Mammals : IMammals
{
    #region IMammals Implementation

    /// <inheritdoc>
    public List<IDog> Dogs { get; set; }

    public List<IPolarBear> PolarBears { get; set; }

    public List<ILion> Lions { get; set; }

    public List<IBottlenoseWhale> BottlenoseWhales { get; set; }

    #endregion // IMammals Implementation

    #region Ctors

    /// <summary>
    /// Default ctor.
    /// </summary>
    public Mammals()
    {
        Dogs = new List<IDog>();
        PolarBears = new List<IPolarBear>();
        Lions = new List<ILion>();
        BottlenoseWhales = new List<IBottlenoseWhale>();
    }

    #endregion // Ctors
}

```

Ostatnim dodanym przeze mnie zwierzęciem był Bottlenose Whale, a aby go dodać, dodałem i zmodyfikowałem następujące klasy i interfejsy:



## 1. Interfejs IBottlenoseWhale:

```
namespace SampleHierarchies.Interfaces.Data.Mammals
{
    4 references
    public interface IBottlenoseWhale : IMammal
    {
        #region Interface members
        /// <summary>
        /// Is a whale have echolocation
        /// </summary>
        2 references
        public bool IsEcholocation { get; set; }
        /// <summary>
        /// Description of echolocation
        /// </summary>
        3 references
        public string EcholocationDescription { get; set; }
        /// <summary>
        /// Is a whale toothed
        /// </summary>
        2 references
        public bool IsToothedWhale { get; set; }
        /// <summary>
        /// Description of whale toothed
        /// </summary>
        3 references
        public string ToothedWhaleDescription { get; set; }
        /// <summary>
        /// How much a whale lives
        /// </summary>
        3 references
        public int LongLifeSpan { get; set; }
        /// <summary>
        /// Is a whale sociable behavior
        /// </summary>
        2 references
        public bool IsSociableBehavior { get; set; }
        /// <summary>
        /// Description of whale social behavior
        /// </summary>
        3 references
        public string SociableBehaviorDescription { get; set; }
        /// <summary>
        /// Is a whale feed on squid
        /// </summary>
        3 references
        public string FeedsOnSquid { get; set; }

        #endregion
    }
}
```

## 2. Klasa BottlenoseWhale:

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

namespace SampleHierarchies.Data.Mammals
{
    11 references
    public class BottlenoseWhale : MammalBase, IBottlenoseWhale
    {
        #region Public Methods
        4 references
        public override void Display()
        {
            Console.WriteLine($"My name is: {Name}, my age is: {Age}, Echolocation: {EcholocationDescription}, Toothed Whale: {ToothedWhaleDescription}, " +
                $"Long Life Span {LongLifeSpan}, Sociable Behavior: {SociableBehaviorDescription}, Feeds on squid: {FeedsOnSquid}");
        }
        #endregion

        #region Ctor and Properties
        2 references
        public bool IsEcholocation { get; set; }
        1 reference
        public string EcholocationDescription { get; set; }
        2 references
        public bool IsToothedWhale { get; set; }
        1 reference
        public string ToothedWhaleDescription { get; set; }
        3 references
        public int LongLifeSpan { get; set; }
        2 references
        public bool IsSociableBehavior { get; set; }
        1 reference
        public string SociableBehaviorDescription { get; set; }
        2 references
        public string FeedsOnSquid { get; set; }

        1 reference
        public BottlenoseWhale(string name, int age, bool isEcholocation, string echolocationDescription, bool isToothedWhale, string toothedWhaleDescription, int longLifeSpan,
            bool isSociableBehavior, string sociableBehaviorDescription, string feedsOnSquid) : base(name, age, MammalSpecies.BottlenoseWhale)
        {
            IsEcholocation = isEcholocation;
            EcholocationDescription = echolocationDescription;
            IsToothedWhale = isToothedWhale;
            ToothedWhaleDescription = toothedWhaleDescription;
            LongLifeSpan = longLifeSpan;
            IsSociableBehavior = isSociableBehavior;
            SociableBehaviorDescription = sociableBehaviorDescription;
            FeedsOnSquid = feedsOnSquid;
        }
        #endregion
    }
}
```

Zmieniłem również enum MammalSpecies, aby dodać do niego nowe zwierzęta:

```

using System.ComponentModel;
/// <summary>
/// Dummy enum.
/// </summary>
public enum MammalSpecies
{
    [Description("Simple description of a none")]
    None = 0,
    [Description("Simple description of a dog")]
    Dog = 1,
    [Description("Simple description of a cat")]
    Cat = 2,
    [Description("Simple description of a polar bear")]
    PolarBear = 3,
    [Description("Simple description of a lion")]
    Lion = 4,
    [Description("Simple description of a bootlenose whale")]
    BottlenoseWhale = 5,
}

```

### 3. Klasa BottlenoseWhaleScreen

```

namespace SampleHierarchies.Gui
{
    public class BottlenoseWhaleScreen : Screen
    {
        #region Ctor and Properties
        /// <summary>
        /// Properties
        /// </summary>
        private IDataService _dataService;
        private ISettings _settings;

        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="dataService"></param>
        /// <param name="settings"></param>
        public BottlenoseWhaleScreen(IDataService dataService, ISettings settings)
        {
            _dataService = dataService;
            _settings = settings;
        }

        #endregion
    }
}

```

```

#region Public methods
public override void Show()
{
    while (true)
    {
        _settings = new Settings();
        _settings.ScreenColor = _settings.ReadValue("BottlenoseWhaleScreenColor", "white");
        Console.ForegroundColor = (ConsoleColor)Enum.Parse(typeof(ConsoleColor), _settings.ScreenColor);

        Console.WriteLine();
        Console.WriteLine("your available choices are:");
        Console.WriteLine("0. Exit");
        Console.WriteLine("1. List all bottlenose whales");
        Console.WriteLine("2. Create a new bottlenose whale");
        Console.WriteLine("3. Delete bottlenose whale");
        Console.WriteLine("4. Modify bottlenose whale");
        Console.WriteLine("Please enter your choice: ");

        string? menuChoiceAsString = Console.ReadLine();
        try
        {
            if (menuChoiceAsString is null)
            {
                throw new ArgumentNullException(nameof(menuChoiceAsString));
            }

            BottlenoseWhaleScreenChoices choice = (BottlenoseWhaleScreenChoices)Int32.Parse(menuChoiceAsString);
            switch (choice)
            {
                case BottlenoseWhaleScreenChoices.List:
                    ListBottlenoseWhales();
                    break;
                case BottlenoseWhaleScreenChoices.Create:
                    AddBottlenoseWhale();
                    break;
                case BottlenoseWhaleScreenChoices.Delete:
                    DeleteBottlenoseWhale();
                    break;
                case BottlenoseWhaleScreenChoices.Modify:
                    EditBottlenoseWhaleRecent();
                    break;
                case BottlenoseWhaleScreenChoices.Exit:
                    Console.WriteLine("Returning to previous menu");
                    return;
            }
        }
        catch
        {
            Console.WriteLine("Invalid choice. Try again.");
        }
    }
}

```

```

private void AddBottlenoseWhale()
{
    try
    {
        BottlenoseWhale whale = AddEditBottlenoseWhale();
        _dataService?.Animals?.Mammals?.BottlenoseWhales?.Add(whale);
        Console.WriteLine("Bottlenose whale with name: {0} has been added to a list of bottlenose whales ", whale.Name);
    }
    catch
    {
        Console.WriteLine("Invalid input.");
    }
}

/// <summary>
/// Shows list of all Bottlenose whales
/// </summary>
/// </summary>
1 reference
private void ListOfBottlenoseWhales()
{
    Console.WriteLine();
    if (_dataService?.Animals?.Mammals?.BottlenoseWhales is not null &&
        _dataService?.Animals?.Mammals?.BottlenoseWhales.Count > 0)
    {
        Console.WriteLine("Here's a list of bottlenose whales:");
        int i = 1;
        foreach (BottlenoseWhale whale in _dataService?.Animals?.Mammals?.BottlenoseWhales)
        {
            Console.WriteLine($"Whale number {i}, ");
            whale.Display();
            i++;
        }
    }
    else
    {
        Console.WriteLine("The list of bottlenose whales is empty.");
    }
}

```

```

/// <summary>
/// Delete an existing Bottlenose whale
/// </summary>
/// </summary>
1 reference
private void DeleteBottlenoseWhale()
{
    try
    {
        Console.WriteLine("What is the name of the bottlenose whale you want to delete? ");
        string? name = Console.ReadLine();
        if (name is null)
        {
            throw new ArgumentNullException(nameof(name));
        }
        BottlenoseWhale? whale = (BottlenoseWhale?)(_dataService?.Animals?.Mammals?.BottlenoseWhales
            ?.FirstOrDefault(wh => wh is not null && string.Equals(wh.Name, name)));
        if (whale is not null)
        {
            _dataService?.Animals?.Mammals?.BottlenoseWhales?.Remove(whale);
            Console.WriteLine("Bottlenose whale with name: {0} has been deleted from a list of bottlenose whales", whale.Name);
        }
        else
        {
            Console.WriteLine("Bottlenose whale not found.");
        }
    }
    catch
    {
        Console.WriteLine("Invalid input.");
    }
}

/// <summary>

```

```

/// <summary>
/// Main function of Add and Edit Bottlenose whale
/// </summary>
/// <returns></returns>
/// <exception cref="ArgumentNullException"></exception>
</documentation>
public BottlenoseWhale AddEditBottlenoseWhale()
{
    bool isEcholocation = false;
    string? echolocationDescription = "Nothing";
    bool isToothedWhale = false;
    string? toothedWhaleDescription = "Nothing";
    bool isSociableBehavior = false;
    string? sociableBehaviorDescription = "Nothing";

    Console.WriteLine("What name of the whale? ");
    string? name = Console.ReadLine();
    Console.WriteLine("What is the whale's age? ");
    string? ageAsString = Console.ReadLine();
    Console.WriteLine("Is this whale use echolocation? (Yes/No) ");
    string? isEcholocationAsString = Console.ReadLine();
    switch (isEcholocationAsString)
    {
        case "Yes":
            isEcholocation = true;
            Console.WriteLine("Describe how he use echolocation ");
            echolocationDescription = Console.ReadLine();
            break;
        case "No":
            isEcholocation = false;
            break;
        default:
            Console.WriteLine("Invalid input");
            break;
    }
    Console.WriteLine("Is this whale toothed? (Yes/No) ");
    string? isToothedWhaleAsString = Console.ReadLine();
    switch (isToothedWhaleAsString)
    {
        case "Yes":
            isToothedWhale = true;
            Console.WriteLine("Describe how his toothed ");
            toothedWhaleDescription = Console.ReadLine();
            break;
        case "No":
            isToothedWhale = false;
            break;
        default:
            Console.WriteLine("Invalid input");
            break;
    }
    Console.WriteLine("How long this whale can live? ");
    string? longLifespanAsString = Console.ReadLine();
    Console.WriteLine("Is this whale social behavior? (Yes/No) ");
    string? isSociableBehaviorAsString = Console.ReadLine();

```

```

switch (isSociableBehaviorAsString)
{
    case "Yes":
        isSociableBehavior = true;
        Console.WriteLine("Describe his social behavior ");
        sociableBehaviorDescription = Console.ReadLine();
        break;
    case "No":
        isSociableBehavior = false;
        break;
    default:
        Console.WriteLine("Invalid input");
        break;
}
Console.WriteLine("How he feeds with squids? ");
string? feedsOnSquid = Console.ReadLine();

if (name is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (ageAsString is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (isEcholocationAsString is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (echolocationDescription is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (isToothedWhaleAsString is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (toothedWhaleDescription is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (longLifespanAsString is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (isSociableBehaviorAsString is null)
{
    throw new ArgumentNullException(nameof(name));
}
if (sociableBehaviorDescription is null)
{
    throw new ArgumentNullException(nameof(name));
}
}

```

```

1 if (FeedsOnSquid is null)
2 {
3     throw new ArgumentException(nameof(name));
4 }
5
6 int age = 0; ParseAgeAsString();
7 int longLifeSpan = 0; ParseLongLifeSpanAsString();
8
9 BottlenoseWhale whale = new BottlenoseWhale(name, age, IsCholocation, echolocationDescription, IsToothedWhale, toothedWhaleDescription, longLifeSpan, IsSocialBehavior, socialBehaviorDescription, FeedsOnSquid);
10
11 return whale;
12 }

```

Również w tej klasie użyłem enum BottlenoseWhaleScreenChoices i zmodyfikowałem klasę IMammals i Mammals, gdzie wcześniej dodałem List<IBottlenoseWhale> BottlenoseWhales:

```

1 using System;
2 using System.Collections.Generic;
3 using System.Linq;
4 using System.Text;
5 using System.Threading.Tasks;
6
7 namespace SampleHierarchies.Enums
8 {
9     7 references
10     public enum BottlenoseWhaleScreenChoices
11     {
12         Exit = 0,
13         List = 1,
14         Create = 2,
15         Delete = 3,
16         Modify = 4,
17     }
18 }

```

```

1 2 references
2 public class Mammals : IMammals
3 {
4     #region IMammals Implementation
5
6     /// <inheritdoc>
7     9 references
8     public List<IDog> Dogs { get; set; }
9
10     9 references
11     public List<IPolarBear> PolarBears { get; set; }
12
13     9 references
14     public List<ILion> Lions { get; set; }
15
16     9 references
17     public List<IBottlenoseWhale> BottlenoseWhales { get; set; }
18
19 #endregion // IMammals Implementation
20
21 #region Ctors
22
23     /// <summary>
24     /// Default ctor.
25     /// </summary>
26     1 reference
27     public Mammals()
28     {
29         Dogs = new List<IDog>();
30         PolarBears = new List<IPolarBear>();
31         Lions = new List<ILion>();
32         BottlenoseWhales = new List<IBottlenoseWhale>();
33     }
34
35 #endregion // Ctors
36 }

```

```

2
3 namespace SampleHierarchies.Interfaces.Data;
4
5 /// <summary>
6 /// Mammals collection.
7 /// </summary>
8 public interface IMammals
9 {
10     #region Interface Members
11
12     /// <summary>
13     /// Dogs collection.
14     /// </summary>
15     List<IDog> Dogs { get; set; }
16     /// <summary>
17     /// Polar Bears collection
18     /// </summary>
19     List<IPolarBear> PolarBears { get; set; }
20     /// <summary>
21     /// Lions collection
22     /// </summary>
23     List<ILion> Lions { get; set; }
24     /// <summary>
25     /// Bottlenose whales collection
26     /// </summary>
27     List<IBottlenoseWhale> BottlenoseWhales { get; set; }
28     #endregion // Interface Members
29 }
30

```

Próbowałem dodać komentarze do całego kodu, wszystkie zadania zostały wykonane, a projekt nie ma błędów ani ostrzeżeń:

