Міністерство освіти і науки України
Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського»

Факультет інформатики та обчислювальної техніки

Кафедра інформатики та програмної інженерії

Звіт

з лабораторної роботи №2
з дисципліни
«Основи розробки програмного забезпечення на платформі Microsoft.NET»

«LINQ to XML»

Виконала ІП-21 Голованьов Г.О.

Київ 2024

Комп‘ютерний практикум № 2

LINQ to XML

Мета: ознайомитися з обробкою XML документів з використанням технології LINQ to XMLОпис архітектури проекту

Програма має такі класи: Commandant, Hostel, Settlement і Student.

Commandant – клас, що являє собою сутність «комендант». Містить таку інформацію: індефікаційний номер, ім’я, вік, досвід та гендер. Об’єкти даного класу можна вивести за допомогою перевантаженого методу ToString().

Student – клас, що являє собою сутність «студент». Містить таку інформацію: індефікаційний номер, ім’я, факультет, кафедра, курс,рік народження та гендер. Об’єкти даного класу можна вивести за допомогою перевантаженого методу ToString().

Hostel – клас, що являє собою сутність «гуртожиток». Містить таку інформацію: індефікаційний номер, адреса, кількість кімнат та індефікаційний номер коменданта. Об’єкти даного класу можна вивести за допомогою перевантаженого методу ToString().

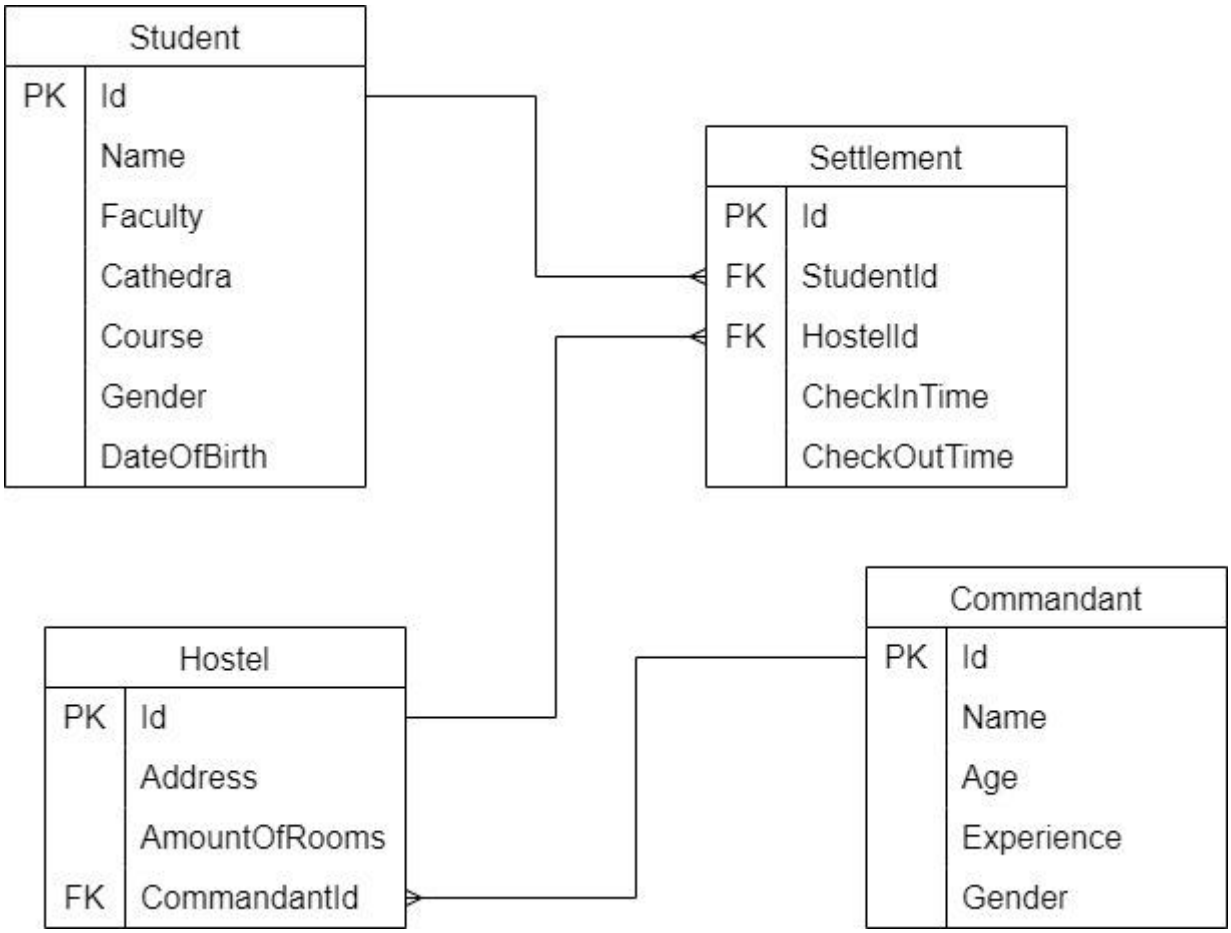
Settlement – проміжний клас, що являє собою сутність «заселення». Слугує для вирішення зв’язку many-to-many між класами Student та Hostel. Містить таку інформацію: індефікаційний номер, індефікаційний номер студента, індефікаційний номер гуртожитку, час заселення та час виселення. Об’єкти даного класу можна вивести за допомогою перевантаженого методу ToString().

Зв’язки між класами:

Student та Hostel – many-to-many, вирішений за допомогою класу Settlement. Багато студентів можуть жити в багатьох гуртожитках

Hostel та Commandant – one-to-many. Вахтер може працювати в будь-якому з гуртожитків, але в одному.

ER-модель



Словесний опис запитів

Знаходить студентів факультету "FICT".

```
var fictStudents = from studentElement in doc.Descendants("Studnets")
                   select new Student
                   {
                       Id = int.Parse(studentElement.Element("Id").Value),
                       Name = studentElement.Element("Name").Value,
                       Faculty = studentElement.Element("Faculty").Value,
                       Cathedra = studentElement.Element("Cathedra").Value,
                       Course = int.Parse(studentElement.Element("Course").Value),
                       Gender = studentElement.Element("Gender").Value,
                                       YearOfBirth =
                   int.Parse(studentElement.Element("YearOfBirth").Value)
                   };
```

Знаходить комендантів гуртожитків з кількістю кімнат менше 300.

```
var lowCapacityCommandants = from commandantElement in
doc.Descendants("Commandants")
                              where doc.Descendants("Hostels").Any(hostel =>
(int)hostel.Element("CommandantId") == (int)commandantElement.Element("Id") &&
(int)hostel.Element("AmountOfRooms") < 300)
                              select new Commandant
                              {
                                  Id =
int.Parse(commandantElement.Element("Id").Value),
                                  Name = commandantElement.Element("Name").Value,
                                  Age =
int.Parse(commandantElement.Element("Age").Value),
                                  Experience =
int.Parse(commandantElement.Element("Experience").Value),
                                  Gender = commandantElement.Element("Gender").Value
};
```

Об'єднує дані про комендантів і гуртожитки.

```
var commandantsWithHostels = from commandantElement in
doc.Descendants("Commandants")
                             join hostelElement in doc.Descendants("Hostels") on
(int)commandantElement.Element("Id") equals
(int)hostelElement.Element("CommandantId")
                             select new
                             {
                                 CommandantName =
commandantElement.Element("Name").Value,
                                 HostelAddress =
hostelElement.Element("Address").Value,
                                 HostelCapacity =
int.Parse(hostelElement.Element("AmountOfRooms").Value)
                             };
```

Знаходить поселення тривалістю менше 30 днів.

```
var shortTermSettlements = from settlementElement in doc.Descendants("Settlements")
                            where
(DateTime.Parse((string)settlementElement.Element("CheckOutTime").Value) -
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value)).TotalDays <
30
                            select new Settlement
                            {
                                Id =
int.Parse(settlementElement.Element("Id").Value),
                                StudentId =
int.Parse(settlementElement.Element("StudentId").Value),
                                HostelId =
int.Parse(settlementElement.Element("HostelId").Value),
                                CheckInTime =
DateTime.Parse(settlementElement.Element("CheckInTime").Value),
                                CheckOutTime =
DateTime.Parse(settlementElement.Element("CheckOutTime").Value)
                            };
```

Знаходить студентів, які недавно заселилися після 2015 року.

```
var recentStudents = from studentElement in doc.Descendants("Studnets")
                     join settlementElement in doc.Descendants("Settlements") on
(int)studentElement.Element("Id") equals (int)settlementElement.Element("StudentId")
                     where
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value) > new
DateTime(2016, 1, 1)
```

```
                    select new Student
                    {
                        Id = int.Parse(studentElement.Element("Id").Value),
                        Name = studentElement.Element("Name").Value,
                        Faculty = studentElement.Element("Faculty").Value,
                        Cathedra = studentElement.Element("Cathedra").Value,
                        Course = int.Parse(studentElement.Element("Course").Value),
                        Gender = studentElement.Element("Gender").Value,
                        YearOfBirth =
int.Parse(studentElement.Element("YearOfBirth").Value)
                    };
```

Знаходить комендантів з ім'ям, яке містить "a".

```
var commandantsWithA = from commandantElement in doc.Descendants("Commandants")
                       where
commandantElement.Element("Name").Value.ToLower().Contains("a")
                       select new Commandant
                       {
                           Id = int.Parse(commandantElement.Element("Id").Value),
                           Name = commandantElement.Element("Name").Value,
                           Age = int.Parse(commandantElement.Element("Age").Value),
                           Experience =
int.Parse(commandantElement.Element("Experience").Value),
                           Gender = commandantElement.Element("Gender").Value
                       };
```

Знаходить гуртожитки, де чоловіків студентів більше, ніж жінок.

```
var femaleDominatedHostels = from hostelElement in doc.Descendants("Hostels")
                             let hostelId =
int.Parse(hostelElement.Element("Id").Value)
                             let femaleCount =
doc.Descendants("Settlements").Count(settlementElement =>
(int)settlementElement.Element("HostelId") == hostelId &&

doc.Descendants("Studnets").Any(studentElement => (int)studentElement.Element("Id")
== (int)settlementElement.Element("StudentId") &&

studentElement.Element("Gender").Value == "Female"))
                             let maleCount =
doc.Descendants("Settlements").Count(settlementElement =>
(int)settlementElement.Element("HostelId") == hostelId &&

doc.Descendants("Studnets").Any(studentElement => (int)studentElement.Element("Id")
== (int)settlementElement.Element("StudentId") &&

studentElement.Element("Gender").Value == "Male"))
                             where femaleCount > maleCount
                             select new Hostel
                             {
                                 Id = int.Parse(hostelElement.Element("Id").Value),
                                 Address = hostelElement.Element("Address").Value,
                                 AmountOfRooms =
int.Parse(hostelElement.Element("AmountOfRooms").Value),
                                 CommandantId =
int.Parse(hostelElement.Element("CommandantId").Value)
                             };
```

Знаходить поселення, які перетинаються з періодом з 1 грудня 2015 року по 1 січня 2016 року.

```
var overlappingSettlements = from settlementElement in
doc.Descendants("Settlements")
```

```
                                let checkInTime =
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value)
                                let checkOutTime =
DateTime.Parse((string)settlementElement.Element("CheckOutTime").Value)
                                where checkInTime < new DateTime(2016, 1, 1) &&
checkOutTime > new DateTime(2015, 12, 1)
                                select new Settlement
                                {
                                    Id =
int.Parse(settlementElement.Element("Id").Value),
                                    StudentId =
int.Parse(settlementElement.Element("StudentId").Value),
                                    HostelId =
int.Parse(settlementElement.Element("HostelId").Value),
                                    CheckInTime = checkInTime,
                                    CheckOutTime = checkOutTime
                                };
```

Знаходить студентів, які проживають в парних гуртожитках.

```
var studentsInEvenHostels = from studentElement in doc.Descendants("Studnets")
                            let studentId =
int.Parse(studentElement.Element("Id").Value)
                            where
doc.Descendants("Settlements").Any(settlementElement =>
(int)settlementElement.Element("StudentId") == studentId &&
                                 doc.Descendants("Hostels").Any(hostelElement =>
(int)hostelElement.Element("Id") % 2 == 0 &&
                                 (int)hostelElement.Element("Id") ==
(int)settlementElement.Element("HostelId")))
                            select new Student
                            {
                                Id = int.Parse(studentElement.Element("Id").Value),
                                Name = studentElement.Element("Name").Value,
                                Faculty = studentElement.Element("Faculty").Value,
                                Cathedra = studentElement.Element("Cathedra").Value,
                                Course =
int.Parse(studentElement.Element("Course").Value),
                                Gender = studentElement.Element("Gender").Value,
                                YearOfBirth =
int.Parse(studentElement.Element("YearOfBirth").Value)
                            };
```

Знаходить досвідчених комендантів з досвідом більше 10 років.

```
var experiencedCommandants = from commandantElement in
doc.Descendants("Commandants")
                                let experience =
int.Parse(commandantElement.Element("Experience").Value)
                                where experience > 10
                                select new Commandant
                                {
                                    Id =
int.Parse(commandantElement.Element("Id").Value),
                                    Name = commandantElement.Element("Name").Value,
                                    Age =
int.Parse(commandantElement.Element("Age").Value),
                                    Experience = experience,
                                    Gender = commandantElement.Element("Gender").Value
                                };
```

Знаходить гуртожитки, адреса яких містить букву "o".

```
var hostelsWithO = from hostelElement in doc.Descendants("Hostels")
                   let address = hostelElement.Element("Address").Value.ToLower()
                   where address.Contains("o")
```

```
                    select new Hostel
                    {
                        Id = int.Parse(hostelElement.Element("Id").Value),
                        Address = hostelElement.Element("Address").Value,
                        AmountOfRooms =
int.Parse(hostelElement.Element("AmountOfRooms").Value),
                        CommandantId =
int.Parse(hostelElement.Element("CommandantId").Value)
                    };
```

Знаходить поселення з тривалістю в >= 30 днів.

```
var thirtyDaysSettlements = from settlementElement in doc.Descendants("Settlements")
                            let checkInTime =
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value)
                            let checkOutTime =
DateTime.Parse((string)settlementElement.Element("CheckOutTime").Value)
                            where (checkOutTime - checkInTime).TotalDays == 30
                            select new Settlement
                            {
                                Id =
int.Parse(settlementElement.Element("Id").Value),
                                StudentId =
int.Parse(settlementElement.Element("StudentId").Value),
                                HostelId =
int.Parse(settlementElement.Element("HostelId").Value),
                                CheckInTime = checkInTime,
                                CheckOutTime = checkOutTime
                            };
```

Об'єднує дані про студентів та комендантів гуртожитків.

```
var studentCommandantNames = from studentElement in doc.Descendants("Studnets")
                             join settlementElement in
doc.Descendants("Settlements") on int.Parse(studentElement.Element("Id").Value)
equals int.Parse(settlementElement.Element("StudentId").Value)
                             join hostelElement in doc.Descendants("Hostels") on
int.Parse(settlementElement.Element("HostelId").Value) equals
int.Parse(hostelElement.Element("Id").Value)
                             join commandantElement in
doc.Descendants("Commandants") on
int.Parse(hostelElement.Element("CommandantId").Value) equals
int.Parse(commandantElement.Element("Id").Value)
                             select new
                             {
                                 StudentName = studentElement.Element("Name").Value,
                                 CommandantName =
commandantElement.Element("Name").Value
                             };
```

Знаходить середній вік студентів для кожного гуртожитку.

```
var averageStudentAgeByHostel = from studentElement in doc.Descendants("Studnets")
                                join settlementElement in
doc.Descendants("Settlements") on int.Parse(studentElement.Element("Id").Value)
equals int.Parse(settlementElement.Element("StudentId").Value)
                                group studentElement by
int.Parse(settlementElement.Element("HostelId").Value) into g
                                select new
                                {
                                    HostelId = g.Key,
                                    AverageAge = g.Average(student =>
DateTime.Now.Year - int.Parse(student.Element("YearOfBirth").Value))
                                };
```

Знаходить імена студентів, які проживають в гуртожитках з кількістю кімнат більше 200.

```
var studentsInHighCapacityHostels = from studentElement in
doc.Descendants("Studnets")
                                    join settlementElement in
doc.Descendants("Settlements") on int.Parse(studentElement.Element("Id").Value)
equals int.Parse(settlementElement.Element("StudentId").Value)
                                    join hostelElement in doc.Descendants("Hostels")
on int.Parse(settlementElement.Element("HostelId").Value) equals
int.Parse(hostelElement.Element("Id").Value)
                                    where
int.Parse(hostelElement.Element("AmountOfRooms").Value) > 200
                                    select new
                                    {
                                        StudentName =
studentElement.Element("Name").Value
                                    };
```

Знаходить поселення тривалістю менше 90 днів.

```
var longTermSettlements = from settlementElement in doc.Descendants("Settlements")
                          where
(DateTime.Parse((string)settlementElement.Element("CheckOutTime").Value) -
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value)).TotalDays <
90
                          select new Settlement
                          {
                              Id =
int.Parse(settlementElement.Element("Id").Value),
                              StudentId =
int.Parse(settlementElement.Element("StudentId").Value),
                              HostelId =
int.Parse(settlementElement.Element("HostelId").Value),
                              CheckInTime =
DateTime.Parse(settlementElement.Element("CheckInTime").Value),
                              CheckOutTime =
DateTime.Parse(settlementElement.Element("CheckOutTime").Value)
```

};Програмний код

Commandant.cs

```
internal class Commandant
{
    public int Id;
    public string Name;
    public int Age;
    public int Experience;
    public string Gender;

    public override string ToString()
    {
        return $"Id: {Id}, Name: {Name}, Age: {Age}, Experience: {Experience}
years";
    }
}
```

Hostel.cs

```
internal class Hostel
{
    public int Id;
    public string Address;
    public int AmountOfRooms;
    public int CommandantId;

    public override string ToString()
```

```
    {
        return $"Id: {Id}, Address: {Address}, Amount of Rooms: {AmountOfRooms},
Commandant Id: {CommandantId}";
    }
}
```

Settlement.cs

```
internal class Settlement
{
    public int Id;
    public int StudentId;
    public int HostelId;

    public DateTime CheckInTime;
    public DateTime CheckOutTime;


    public override string ToString()
    {
        return $"Id: {Id}, StudentId: {StudentId}, HostelId: {HostelId},
CheckInTime: {CheckInTime}, CheckOutTime: {CheckOutTime}";
    }
}
```

Student.cs

```
internal class Student
{
    public int Id;
    public string Name;
    public string Faculty;
    public string Cathedra;
    public int Course;
    public string Gender;
    public int DateOfBirth;

    public override string ToString()
    {
        return $"Id: {Id}, Name: {Name}, Faculty: {Faculty}, Cathedra: {Cathedra},
Course: {Course}";
    }
}
```

ConsoleInput.cs

```
using System;
using System.Collections.Generic;
using System.Xml;

namespace net_lab2.Input
{
    class ConsoleInput
    {
        public static void InputWithConsole()
        {
            List<Commandant> commandants = new List<Commandant>();

            while (true)
            {
                int commandantsIdCounter = 1;
                Commandant commandant = InputCommandantDetails(ref
commandantsIdCounter);
                commandants.Add(commandant);
                commandantsIdCounter++;
```

```
                Console.Write("Do you want to enter another commandant? (y/n): ");
                if (Console.ReadLine().ToLower() != "y")
                    break;
            }

            List<Hostel> hostels = new List<Hostel>();

            while (true)
            {
                int hostelsIdCounter = 1;
                Hostel hostel = InputHostelDetails(ref hostelsIdCounter);
                hostels.Add(hostel);
                hostelsIdCounter++;

                Console.Write("Do you want to enter another hostel? (y/n): ");
                if (Console.ReadLine().ToLower() != "y")
                    break;
            }

            List<Student> students = new List<Student>();

            while (true)
            {
                int studentsIdCounter = 1;
                Student student = InputStudentDetails(ref studentsIdCounter);
                students.Add(student);
                studentsIdCounter++;

                Console.Write("Do you want to enter another student? (y/n): ");
                if (Console.ReadLine().ToLower() != "y")
                    break;
            }

            List<Settlement> settlements = new List<Settlement>();

            while (true)
            {
                int settlementsIdCounter = 1;
                Settlement settlement = InputSettlementDetails(ref
settlementsIdCounter);
                settlements.Add(settlement);
                settlementsIdCounter++;

                Console.Write("Do you want to enter another settlement? (y/n): ");
                if (Console.ReadLine().ToLower() != "y")
                    break;
            }

            // Save data to XML
            SaveDataToXml(commandants, hostels, settlements, students);

            Console.WriteLine("Data saved to XML file successfully.");
            Console.ReadKey();

        }

        public static Commandant InputCommandantDetails(ref int idCounter)
        {
            Commandant commandant = new Commandant();
            commandant.Id = idCounter;
            Console.WriteLine("Enter commandant details:");
            Console.Write("Name: ");
            commandant.Name = Console.ReadLine();
            Console.Write("Age: ");
            commandant.Age = int.Parse(Console.ReadLine());
```

```
            Console.Write("Experience: ");
            commandant.Experience = int.Parse(Console.ReadLine());
            Console.Write("Gender: ");
            commandant.Gender = Console.ReadLine();
            return commandant;
        }

        static public Hostel InputHostelDetails(ref int idCounter)
        {
            Hostel hostel = new Hostel();
            hostel.Id = idCounter;
            Console.WriteLine("\nEnter hostel details:");
            Console.Write("Address: ");
            hostel.Address = Console.ReadLine();
            Console.Write("Amount Of Rooms: ");
            hostel.AmountOfRooms = int.Parse(Console.ReadLine());
            Console.Write("Commandant Id: ");
            hostel.CommandantId = int.Parse(Console.ReadLine());
            return hostel;
        }

        static Settlement InputSettlementDetails(ref int idCounter)
        {
            Settlement settlement = new Settlement();
            settlement.Id = idCounter;
            Console.WriteLine("\nEnter settlement details:");
            Console.Write("Student Id: ");
            settlement.StudentId = int.Parse(Console.ReadLine());
            Console.Write("Hostel Id: ");
            settlement.HostelId = int.Parse(Console.ReadLine());
            settlement.CheckInTime = DateTime.Now;
            Console.Write("How much time would you be there?(Months): ");
            uint amountOfMonths = uint.Parse(Console.ReadLine());
            settlement.CheckOutTime =
DateTime.Now.AddMonths(int.Parse(amountOfMonths.ToString()));
            return settlement;
        }

        static Student InputStudentDetails(ref int idCounter)
        {
            Student student = new Student();
            student.Id = idCounter;
            Console.WriteLine("\nEnter student details:");
            Console.Write("Name: ");
            student.Name = Console.ReadLine();
            Console.Write("Faculty: ");
            student.Faculty = Console.ReadLine();
            Console.Write("Cathedra: ");
            student.Cathedra = Console.ReadLine();
            Console.Write("Course: ");
            student.Course = int.Parse(Console.ReadLine());
            Console.Write("Gender: ");
            student.Gender = Console.ReadLine();
            Console.Write("Year Of Birth: ");
            student.YearOfBirth = int.Parse(Console.ReadLine());
            return student;
        }

        static void SaveDataToXml(List<Commandant> commandants, List<Hostel>
hostels, List<Settlement> settlements, List<Student> students)
        {
            string filePath = "console.xml";

            XmlWriterSettings settings = new XmlWriterSettings
            {
```

```
                Indent = true,
                IndentChars = "\t",
                NewLineChars = "\n",
                NewLineHandling = NewLineHandling.Replace
            };

            using (XmlWriter writer = XmlWriter.Create(filePath, settings))
            {
                writer.WriteStartDocument();
                writer.WriteStartElement("Data");

                // Save commandants
                writer.WriteStartElement("Commandants");
                foreach (var commandant in commandants)
                {
                    writer.WriteStartElement("Commandant");
                    writer.WriteElementString("Id", commandant.Id.ToString());
                    writer.WriteElementString("Name", commandant.Name);
                    writer.WriteElementString("Age", commandant.Age.ToString());
                    writer.WriteElementString("Experience",
commandant.Age.ToString());
                    writer.WriteElementString("Gender", commandant.Gender);
                    writer.WriteEndElement();
                }
                writer.WriteEndElement();

                // Save hostels
                writer.WriteStartElement("Hostels");
                foreach (var hostel in hostels)
                {
                    writer.WriteStartElement("Hostel");
                    writer.WriteElementString("Id", hostel.Id.ToString());
                    writer.WriteElementString("Address", hostel.Address);
                    writer.WriteElementString("AmountOfRooms",
hostel.AmountOfRooms.ToString());
                    writer.WriteElementString("CommandantId",
hostel.CommandantId.ToString());
                    writer.WriteEndElement();
                }
                writer.WriteEndElement();

                // Save settlements
                writer.WriteStartElement("Settlements");
                foreach (var settlement in settlements)
                {
                    writer.WriteStartElement("Settlement");
                    writer.WriteElementString("Id", settlement.Id.ToString());
                    writer.WriteElementString("StudentId",
settlement.StudentId.ToString());
                    writer.WriteElementString("HostelId",
settlement.HostelId.ToString());
                    writer.WriteElementString("CheckInTime",
settlement.CheckInTime.ToString());
                    writer.WriteElementString("CheckOutTime",
settlement.CheckOutTime.ToString());
                    writer.WriteEndElement();
                }
                writer.WriteEndElement();

                // Save students
                writer.WriteStartElement("Students");
                foreach (var student in students)
                {
                    writer.WriteStartElement("Student");
                    writer.WriteElementString("Id", student.Id.ToString());
```

```
                    writer.WriteElementString("Name", student.Name);
                    writer.WriteElementString("Faculty", student.Faculty);
                    writer.WriteElementString("Cathedra", student.Cathedra);
                    writer.WriteElementString("Course", student.Course.ToString());
                    writer.WriteElementString("Gender", student.Gender);
                    writer.WriteElementString("YearOfBirth",
student.YearOfBirth.ToString());

                    writer.WriteEndElement();
                }
                writer.WriteEndElement();

                writer.WriteEndElement();
                writer.WriteEndDocument();
            }
        }
    }
}
```

Program.cs

```
using System;

using System.Collections.Generic;

using System.IO;

using System.Linq;

using System.Xml;

using System.Xml.Linq;

using System.Xml.Serialization;

using net_lab2.Input;




namespace net_lab2

{

    internal class Program

    {

        static void Main(string[] args)

        {

            string filePath = "test.xml";
```

```
//options to choose the way to input ur data into application



while (true)

{

    Console.WriteLine("\nHow would you prefer to act:\n1.Load from \"TEST.xml\"\n2.Insert it by yourself\n3.Serializer example\n4.Display with XDocument\n\n0. Goto requests");

    int choice = int.Parse(Console.ReadLine());

    if (choice == 1)

    {

        filePath = "TEST.xml";

    }

    if (choice == 2)

    {

        ConsoleInput.InputWithConsole();

        filePath = "console.xml";

    }

    if (choice == 3)
```

```
{

    List<Student> students = new List<Student>
    {
        new Student { Id = 1, Name = "John", Faculty = "FIOT", Cathedra
="IPI",Course=2, Gender = "Male" , YearOfBirth = 2005},
        new Student { Id = 2, Name = "Olya", Faculty = "FIOT", Cathedra
="OT",Course=4, Gender = "Female" , YearOfBirth = 2001}
    };

    List<Commandant> commandants = new List<Commandant>
    {
        new Commandant { Id = 1, Name = "John", Age = 40, Experience
= 5, Gender = "Male" },
        new Commandant { Id = 2, Name = "Alice", Age = 35, Experience
= 8, Gender = "Female" }
    };

    List<Hostel> hostels = new List<Hostel>
```

```
            {
                new Hostel { Id = 1, Address = "123 Main St", AmountOfRooms =
50, CommandantId = 1 },
                new Hostel { Id = 2, Address = "456 Elm St", AmountOfRooms =
40, CommandantId = 2 }
            };


            List<Settlement> settlements = new List<Settlement>
            {
                new Settlement { Id = 1, StudentId = 1, HostelId = 1,
CheckInTime=DateTime.Now, CheckOutTime=DateTime.Now.AddMonths(1)},
                new Settlement { Id = 2, StudentId = 2, HostelId = 2,
CheckInTime=DateTime.Now, CheckOutTime=DateTime.Now.AddMonths(2) }
            };


            /* List<Student> students = new List<Student>
             {
                new Student { Id = 1, Name = "Joe", Faculty = "FICT", Cathedra =
"IPI", Course = 1, Gender = "Male", YearOfBirth = 2006 },
```

```
            new Student { Id = 2, Name = "Nadiya", Faculty = "FICT",
Cathedra = "IPI", Course = 1, Gender = "Female", YearOfBirth = 2006 },

            new Student { Id = 3, Name = "Alexandr", Faculty = "FICT",
Cathedra = "IPI", Course = 2, Gender = "Male", YearOfBirth = 2005 },

            new Student { Id = 4, Name = "Myhailo", Faculty = "FICT",
Cathedra = "IPI", Course = 2, Gender = "Male", YearOfBirth = 2004 },

            new Student { Id = 5, Name = "Oksana", Faculty = "FICT",
Cathedra = "OT", Course = 3, Gender = "Female", YearOfBirth = 2002 }

        };



        List<Commandant> commandants = new List<Commandant>

        {

            new Commandant { Id = 1, Name = "Adriy", Age = 40, Experience
= 5, Gender = "Male" },

            new Commandant { Id = 2, Name = "Olena", Age = 45, Experience
= 1, Gender = "Female" },

            new Commandant { Id = 3, Name = "Sophia", Age = 60,
Experience = 23, Gender = "Female" },

            new Commandant { Id = 4, Name = "Oksana", Age = 70,
Experience = 4, Gender = "Female" },
```

```
            new Commandant { Id = 5, Name = "Maxik", Age = 43,
Experience = 14, Gender = "Male" }

        };



        List<Hostel> hostels = new List<Hostel>

        {

            new Hostel { Id = 1, Address = "Boholubova", AmountOfRooms =
200, CommandantId = 5 },

            new Hostel { Id = 2, Address = "Retardova", AmountOfRooms =
250, CommandantId = 4 },

            new Hostel { Id = 3, Address = "Politehnichna", AmountOfRooms
= 140, CommandantId = 3 },

            new Hostel { Id = 4, Address = "Knushna", AmountOfRooms =
600, CommandantId = 2 },

            new Hostel { Id = 5, Address = "Simonova", AmountOfRooms =
800, CommandantId = 1 }

        };



        List<Settlement> settlements = new List<Settlement>

        {
```

```
                new Settlement { Id = 1, StudentId = 2, HostelId = 3, CheckInTime
= new DateTime(2015, 12, 13), CheckOutTime = new DateTime(2016, 1, 13) },

                new Settlement { Id = 2, StudentId = 3, HostelId = 1, CheckInTime
= new DateTime(2015, 11, 12), CheckOutTime = new DateTime(2015, 11, 12) },

                new Settlement { Id = 3, StudentId = 1, HostelId = 2, CheckInTime
= new DateTime(2015, 1, 1), CheckOutTime = new DateTime(2015, 2, 1) },

                new Settlement { Id = 4, StudentId = 4, HostelId = 3, CheckInTime
= new DateTime(2015, 3, 13), CheckOutTime = new DateTime(2016, 4, 13) },

                new Settlement { Id = 5, StudentId = 5, HostelId = 1, CheckInTime
= new DateTime(2015, 5, 13), CheckOutTime = new DateTime(2016, 7, 13) }

            };*/



            SerializeToXml("Serializer.xml", commandants, hostels, students,
settlements);

            Console.ReadKey();

            DeserializeAndPrintFromXml("Serializer.xml");



        }

        if (choice == 4)

        {
```

```
        DisplayDoc(filePath);
    }

    if (choice == 0) { break; }
}
//requests

XDocument doc = XDocument.Load("TEST.xml");
Console.WriteLine("WORK:");
//here we go

Console.WriteLine("Get students from the \\\"FICT\\\" faculty.\"");
var fictStudents = from studentElement in doc.Descendants("Studnets")
                   select new Student
                   {
                       Id = int.Parse(studentElement.Element("Id").Value),
                       Name = studentElement.Element("Name").Value,
```

```
                    Faculty = studentElement.Element("Faculty").Value,

                    Cathedra = studentElement.Element("Cathedra").Value,

                    Course =
int.Parse(studentElement.Element("Course").Value),

                    Gender = studentElement.Element("Gender").Value,

                    YearOfBirth =
int.Parse(studentElement.Element("YearOfBirth").Value)

                };



        foreach (var item in fictStudents)

        {

            Console.WriteLine(item.ToString());

        }

        Console.ReadKey();



        Console.WriteLine("Get commandants from hostels with less than 300
rooms.");

        var lowCapacityCommandants = from commandantElement in
doc.Descendants("Commandants")
```

```
                                where doc.Descendants("Hostels").Any(hostel =>
(int)hostel.Element("CommandantId") == (int)commandantElement.Element("Id")
&& (int)hostel.Element("AmountOfRooms") < 300)

                                select new Commandant

                                {

                                    Id =
int.Parse(commandantElement.Element("Id").Value),

                                    Name =
commandantElement.Element("Name").Value,

                                    Age =
int.Parse(commandantElement.Element("Age").Value),

                                    Experience =
int.Parse(commandantElement.Element("Experience").Value),

                                    Gender =
commandantElement.Element("Gender").Value

                                };



        foreach (var commandant in lowCapacityCommandants)

        {
```

```
            Console.WriteLine($"Id: {commandant.Id}, Name:
{commandant.Name}, Age: {commandant.Age}, Experience:
{commandant.Experience}, Gender: {commandant.Gender}");

        }

        Console.ReadKey();



        Console.WriteLine("Get commandants and hostels.");

        var commandantsWithHostels = from commandantElement in
doc.Descendants("Commandants")

                                join hostelElement in doc.Descendants("Hostels") on
(int)commandantElement.Element("Id") equals
(int)hostelElement.Element("CommandantId")

                                select new

                                {

                                    CommandantName =
commandantElement.Element("Name").Value,

                                    HostelAddress =
hostelElement.Element("Address").Value,

                                    HostelCapacity =
int.Parse(hostelElement.Element("AmountOfRooms").Value)

                                };
```

```
foreach (var item in commandantsWithHostels)
{
    Console.WriteLine($"Commandant: {item.CommandantName}, Hostel: {item.HostelAddress}, Capacity: {item.HostelCapacity}");
}
Console.ReadKey();


Console.WriteLine("Get settlements with a duration less than 30 days.");
var shortTermSettlements = from settlementElement in doc.Descendants("Settlements")
                           where (DateTime.Parse((string)settlementElement.Element("CheckOutTime").Value) - DateTime.Parse((string)settlementElement.Element("CheckInTime").Value)).TotalDays < 30
                           select new Settlement
                           {
                               Id = int.Parse(settlementElement.Element("Id").Value),
                               StudentId = int.Parse(settlementElement.Element("StudentId").Value),
```

```
                                HostelId =
int.Parse(settlementElement.Element("HostelId").Value),

                                CheckInTime =
DateTime.Parse(settlementElement.Element("CheckInTime").Value),

                                CheckOutTime =
DateTime.Parse(settlementElement.Element("CheckOutTime").Value)

                            };



        foreach (var item in shortTermSettlements)

        {

            Console.WriteLine($"Id: {item.Id}, StudentId: {item.StudentId},
HostelId: {item.HostelId}, CheckInTime: {item.CheckInTime}, CheckOutTime:
{item.CheckOutTime}");

        }

        Console.ReadKey();



        Console.WriteLine("Get students who settled after January 1, 2016");

        var recentStudents = from studentElement in doc.Descendants("Studnets")
```

```
                        join settlementElement in doc.Descendants("Settlements") on
(int)studentElement.Element("Id") equals
(int)settlementElement.Element("StudentId")

                        where
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value) > new
DateTime(2016, 1, 1)

                        select new Student

                        {

                            Id = int.Parse(studentElement.Element("Id").Value),

                            Name = studentElement.Element("Name").Value,

                            Faculty = studentElement.Element("Faculty").Value,

                            Cathedra = studentElement.Element("Cathedra").Value,

                            Course =
int.Parse(studentElement.Element("Course").Value),

                            Gender = studentElement.Element("Gender").Value,

                            YearOfBirth =
int.Parse(studentElement.Element("YearOfBirth").Value)

                        };



            foreach (var student in recentStudents)
```

```
        {
            Console.WriteLine($"Id: {student.Id}, Name: {student.Name}, Faculty: {student.Faculty}, Cathedra: {student.Cathedra}, Course: {student.Course}, Gender: {student.Gender}, YearOfBirth: {student.YearOfBirth}");
        }
        Console.ReadKey();


        Console.WriteLine("Get commandants with names containing the letter \"a\".");
        var commandantsWithA = from commandantElement in doc.Descendants("Commandants")
                               where commandantElement.Element("Name").Value.ToLower().Contains("a")
                               select new Commandant
                               {
                                   Id = int.Parse(commandantElement.Element("Id").Value),
                                   Name = commandantElement.Element("Name").Value,
                                   Age = int.Parse(commandantElement.Element("Age").Value),
```

```
                                Experience =
int.Parse(commandantElement.Element("Experience").Value),

                                Gender = commandantElement.Element("Gender").Value

                            };



            foreach (var commandant in commandantsWithA)

            {

                Console.WriteLine($"Id: {commandant.Id}, Name:
{commandant.Name}, Age: {commandant.Age}, Experience:
{commandant.Experience}, Gender: {commandant.Gender}");

            }

            Console.ReadKey();



            Console.WriteLine("Get hostels with more female students than male
students.");

            var femaleDominatedHostels = from hostelElement in
doc.Descendants("Hostels")

                                let hostelId =
int.Parse(hostelElement.Element("Id").Value)
```

```
                    let femaleCount =
doc.Descendants("Settlements").Count(settlementElement =>
(int)settlementElement.Element("HostelId") == hostelId &&


doc.Descendants("Studnets").Any(studentElement =>
(int)studentElement.Element("Id") ==
(int)settlementElement.Element("StudentId") &&

                        studentElement.Element("Gender").Value ==
"Female"))

                    let maleCount =
doc.Descendants("Settlements").Count(settlementElement =>
(int)settlementElement.Element("HostelId") == hostelId &&


doc.Descendants("Studnets").Any(studentElement =>
(int)studentElement.Element("Id") ==
(int)settlementElement.Element("StudentId") &&

                        studentElement.Element("Gender").Value ==
"Male"))

                    where femaleCount > maleCount

                    select new Hostel

                    {

                        Id = int.Parse(hostelElement.Element("Id").Value),

                        Address = hostelElement.Element("Address").Value,
```

```
                                AmountOfRooms =
int.Parse(hostelElement.Element("AmountOfRooms").Value),

                                CommandantId =
int.Parse(hostelElement.Element("CommandantId").Value)

                            };



        foreach (var hostel in femaleDominatedHostels)

        {

            Console.WriteLine($"Id: {hostel.Id}, Address: {hostel.Address},
AmountOfRooms: {hostel.AmountOfRooms}, CommandantId:
{hostel.CommandantId}");

        }

        Console.ReadKey();



        Console.WriteLine("Get settlements overlapping December 1, 2015, to
January 1, 2016.");

        var overlappingSettlements = from settlementElement in
doc.Descendants("Settlements")

                            let checkInTime =
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value)
```

```
                                let checkOutTime =
DateTime.Parse((string)settlementElement.Element("CheckOutTime").Value)

                                where checkInTime < new DateTime(2016, 1, 1) &&
checkOutTime > new DateTime(2015, 12, 1)

                                select new Settlement

                                {

                                    Id =
int.Parse(settlementElement.Element("Id").Value),

                                    StudentId =
int.Parse(settlementElement.Element("StudentId").Value),

                                    HostelId =
int.Parse(settlementElement.Element("HostelId").Value),

                                    CheckInTime = checkInTime,

                                    CheckOutTime = checkOutTime

                                };



            foreach (var settlement in overlappingSettlements)

            {
```

```
            Console.WriteLine($"Id: {settlement.Id}, StudentId:
{settlement.StudentId}, HostelId: {settlement.HostelId}, CheckInTime:
{settlement.CheckInTime}, CheckOutTime: {settlement.CheckOutTime}");

        }

        Console.ReadKey();



        Console.WriteLine("Get students from hostels with even IDs.");

        var studentsInEvenHostels = from studentElement in
doc.Descendants("Studnets")

                                let studentId =
int.Parse(studentElement.Element("Id").Value)

                                where
doc.Descendants("Settlements").Any(settlementElement =>
(int)settlementElement.Element("StudentId") == studentId &&

                                    doc.Descendants("Hostels").Any(hostelElement =>
(int)hostelElement.Element("Id") % 2 == 0 &&

                                    (int)hostelElement.Element("Id") ==
(int)settlementElement.Element("HostelId")))

                                select new Student

                                {

                                    Id = int.Parse(studentElement.Element("Id").Value),
```

```
                                Name = studentElement.Element("Name").Value,

                                Faculty = studentElement.Element("Faculty").Value,

                                Cathedra =
studentElement.Element("Cathedra").Value,

                                Course =
int.Parse(studentElement.Element("Course").Value),

                                Gender = studentElement.Element("Gender").Value,

                                YearOfBirth =
int.Parse(studentElement.Element("YearOfBirth").Value)

                            };



        foreach (var student in studentsInEvenHostels)

        {

            Console.WriteLine($"Id: {student.Id}, Name: {student.Name}, Faculty:
{student.Faculty}, Cathedra: {student.Cathedra}, Course: {student.Course},
Gender: {student.Gender}, YearOfBirth: {student.YearOfBirth}");

        }

        Console.ReadKey();
```

```
Console.WriteLine("Get experienced commandants with more than 10 years of experience.");

var experiencedCommandants = from commandantElement in doc.Descendants("Commandants")

                                let experience = int.Parse(commandantElement.Element("Experience").Value)

                                where experience > 10

                                select new Commandant

                                {

                                    Id = int.Parse(commandantElement.Element("Id").Value),

                                    Name = commandantElement.Element("Name").Value,

                                    Age = int.Parse(commandantElement.Element("Age").Value),

                                    Experience = experience,

                                    Gender = commandantElement.Element("Gender").Value

                                };
```

```
foreach (var commandant in experiencedCommandants)

{

    Console.WriteLine($"Id: {commandant.Id}, Name:
{commandant.Name}, Age: {commandant.Age}, Experience:
{commandant.Experience}, Gender: {commandant.Gender}");

}

Console.ReadKey();



Console.WriteLine("Get hostels with the letter \"o\" in their address.");

var hostelsWithO = from hostelElement in doc.Descendants("Hostels")

                let address =
hostelElement.Element("Address").Value.ToLower()

                where address.Contains("o")

                select new Hostel

                {

                    Id = int.Parse(hostelElement.Element("Id").Value),

                    Address = hostelElement.Element("Address").Value,

                    AmountOfRooms =
int.Parse(hostelElement.Element("AmountOfRooms").Value),
```

```
                    CommandantId =
int.Parse(hostelElement.Element("CommandantId").Value)

                };



        foreach (var hostel in hostelsWithO)

        {

            Console.WriteLine($"Id: {hostel.Id}, Address: {hostel.Address},
AmountOfRooms: {hostel.AmountOfRooms}, CommandantId:
{hostel.CommandantId}");

        }

        Console.ReadKey();



        Console.WriteLine("Get settlements with a duration of exactly 30 days.");

        var thirtyDaysSettlements = from settlementElement in
doc.Descendants("Settlements")

                    let checkInTime =
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value)

                    let checkOutTime =
DateTime.Parse((string)settlementElement.Element("CheckOutTime").Value)

                    where (checkOutTime - checkInTime).TotalDays == 30
```

```
                    select new Settlement
                    {
                        Id = int.Parse(settlementElement.Element("Id").Value),
                        StudentId =
int.Parse(settlementElement.Element("StudentId").Value),
                        HostelId =
int.Parse(settlementElement.Element("HostelId").Value),
                        CheckInTime = checkInTime,
                        CheckOutTime = checkOutTime
                    };


        foreach (var settlement in thirtyDaysSettlements)
        {
            Console.WriteLine($"Id: {settlement.Id}, StudentId:
{settlement.StudentId}, HostelId: {settlement.HostelId}, CheckInTime:
{settlement.CheckInTime}, CheckOutTime: {settlement.CheckOutTime}");
        }
        Console.ReadKey();
```

```
Console.WriteLine("Get students along with their commandants.");

var studentCommandantNames = from studentElement in doc.Descendants("Studnets")

                join settlementElement in doc.Descendants("Settlements") on int.Parse(studentElement.Element("Id").Value) equals int.Parse(settlementElement.Element("StudentId").Value)

                join hostelElement in doc.Descendants("Hostels") on int.Parse(settlementElement.Element("HostelId").Value) equals int.Parse(hostelElement.Element("Id").Value)

                join commandantElement in doc.Descendants("Commandants") on int.Parse(hostelElement.Element("CommandantId").Value) equals int.Parse(commandantElement.Element("Id").Value)

                select new

                {

                    StudentName = studentElement.Element("Name").Value,

                    CommandantName = commandantElement.Element("Name").Value

                };



foreach (var item in studentCommandantNames)
```

```
{
    Console.WriteLine($"Student: {item.StudentName}, Commandant: {item.CommandantName}");
}
Console.ReadKey();


Console.WriteLine("Get the average age of students in each hostel.");
var averageStudentAgeByHostel = from studentElement in doc.Descendants("Studnets")
                                join settlementElement in doc.Descendants("Settlements") on int.Parse(studentElement.Element("Id").Value) equals int.Parse(settlementElement.Element("StudentId").Value)
                                group studentElement by int.Parse(settlementElement.Element("HostelId").Value) into g
                                select new
                                {
                                    HostelId = g.Key,
                                    AverageAge = g.Average(student => DateTime.Now.Year - int.Parse(student.Element("YearOfBirth").Value))
                                };
```

```
foreach (var item in averageStudentAgeByHostel)

{

    Console.WriteLine($"HostelId: {item.HostelId}, AverageAge: {item.AverageAge}");

}

Console.ReadKey();



Console.WriteLine("Get names of students in hostels with capacities greater than 200.");

var studentsInHighCapacityHostels = from studentElement in doc.Descendants("Studnets")

                                    join settlementElement in doc.Descendants("Settlements") on int.Parse(studentElement.Element("Id").Value) equals int.Parse(settlementElement.Element("StudentId").Value)

                                    join hostelElement in doc.Descendants("Hostels") on int.Parse(settlementElement.Element("HostelId").Value) equals int.Parse(hostelElement.Element("Id").Value)

                                    where int.Parse(hostelElement.Element("AmountOfRooms").Value) > 200

                                    select new
```

```
                                    {
                                        StudentName =
studentElement.Element("Name").Value
                                    };


            foreach (var item in studentsInHighCapacityHostels)
            {
                Console.WriteLine($"StudentName: {item.StudentName}");
            }
            Console.ReadKey();


            Console.WriteLine("Get settlements with a duration less than 90 days.");
            var longTermSettlements = from settlementElement in
doc.Descendants("Settlements")
                                where
(DateTime.Parse((string)settlementElement.Element("CheckOutTime").Value) -
DateTime.Parse((string)settlementElement.Element("CheckInTime").Value)).Total
Days < 90
                                select new Settlement
                                {
```

```
                                Id = int.Parse(settlementElement.Element("Id").Value),

                                StudentId =
int.Parse(settlementElement.Element("StudentId").Value),

                                HostelId =
int.Parse(settlementElement.Element("HostelId").Value),

                                CheckInTime =
DateTime.Parse(settlementElement.Element("CheckInTime").Value),

                                CheckOutTime =
DateTime.Parse(settlementElement.Element("CheckOutTime").Value)

                            };



        foreach (var item in shortTermSettlements)

        {

            Console.WriteLine($"Id: {item.Id}, StudentId: {item.StudentId},
HostelId: {item.HostelId}, CheckInTime: {item.CheckInTime}, CheckOutTime:
{item.CheckOutTime}");

        }

        Console.ReadKey();



    }
```

```
public static void DisplayDoc(string path)
{
    try
    {
        XmlDocument xmldoc = new XmlDocument();


        xmldoc.Load(path);


        XmlWriterSettings settings = new XmlWriterSettings
        {
            Indent = true,
            IndentChars = "\t"
        };
```

```
            using (XmlWriter writer = XmlWriter.Create(Console.Out, settings))
            {
                xmldoc.Save(writer);
            }
        }
        catch (Exception ex)
        {
            Console.WriteLine($"Error: {ex.Message}");
        }
    }
    static void SerializeToXml(string filePath, List<Commandant> commandants,
List<Hostel> hostels, List<Student> students, List<Settlement> settlements)
    {
        Data data = new Data
        {
            Commandants = commandants,
            Hostels = hostels,
            Students = students,
```

```
        Settlements = settlements
    };

    XmlSerializer serializer = new XmlSerializer(typeof(Data));

    using (StreamWriter writer = new StreamWriter(filePath))
    {
        serializer.Serialize(writer, data);
    }

    Console.WriteLine("Data serialized and saved to XML file successfully.");
}

static void DeserializeAndPrintFromXml(string filePath)
{
    XmlSerializer serializer = new XmlSerializer(typeof(Data));
```

```
using (StreamReader reader = new StreamReader(filePath))
{
    Data data = (Data)serializer.Deserialize(reader);


    Console.WriteLine("Commandants:");
    foreach (var commandant in data.Commandants)
    {
        Console.WriteLine($"{commandant.Id}, {commandant.Name},
{commandant.Age}, {commandant.Experience}, {commandant.Gender}");
    }


    Console.WriteLine("\nHostels:");
    foreach (var hostel in data.Hostels)
    {
        Console.WriteLine($"{hostel.Id}, {hostel.Address},
{hostel.AmountOfRooms}, {hostel.CommandantId}");
    }
```

```
            Console.WriteLine("\nStudents:");

            foreach (var student in data.Students)

            {

                Console.WriteLine($"{student.Id}, {student.Name},
{student.Faculty}, {student.Cathedra}, {student.Course}, {student.Gender},
{student.YearOfBirth}");

            }



            Console.WriteLine("\nSettlements:");

            foreach (var settlement in data.Settlements)

            {

                Console.WriteLine($"{settlement.Id}, {settlement.StudentId},
{settlement.HostelId}, {settlement.CheckInTime}, {settlement.CheckOutTime}");

            }

        }

    }

  }

}
```

Data.cs

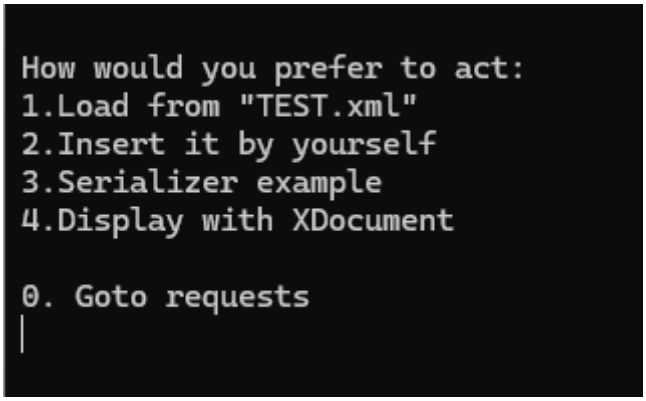
```
using System;
using System.Collections.Generic;
using System.Xml.Serialization;


namespace net_lab2
{

    [Serializable, XmlRoot("Data")]
    public class Data
    {
        [XmlElement("Commandants")]
        public List<Commandant> Commandants { get; set; } = new List<Commandant>();
        [XmlElement("Studnets")]
        public List<Student> Students { get; set; } = new List<Student>();
        [XmlElement("Hostels")]
        public List<Hostel> Hostels { get; set; } = new List<Hostel>();
        [XmlElement("Settlements")]
        public List<Settlement> Settlements { get; set;} = new List<Settlement>();
    }
}
```

Скріншоти виконання

Головне меню



Всі запити

Get students from the \"FICT\" faculty."

Id: 1, Name: Joe, Faculty: FICT, Cathedra: IPI, Course: 1

Id: 2, Name: Nadiya, Faculty: FICT, Cathedra: IPI, Course: 1

Id: 3, Name: Alexandr, Faculty: FICT, Cathedra: IPI, Course: 2

Id: 4, Name: Myhailo, Faculty: FICT, Cathedra: IPI, Course: 2

Id: 5, Name: Oksana, Faculty: FICT, Cathedra: OT, Course: 3

Get commandants from hostels with less than 300 rooms.

Id: 3, Name: Sophia, Age: 60, Experience: 23, Gender: Female

Id: 4, Name: Oksana, Age: 70, Experience: 4, Gender: Female

Id: 5, Name: Maxik, Age: 43, Experience: 14, Gender: Male

Get commandants and hostels.

Commandant: Adriy, Hostel: Simonova, Capacity: 800

Commandant: Olena, Hostel: Knushna, Capacity: 600

Commandant: Sophia, Hostel: Politehnichna, Capacity: 140

Commandant: Oksana, Hostel: Retardova, Capacity: 250

Commandant: Maxik, Hostel: Boholubova, Capacity: 200

Get settlements with a duration less than 30 days.

Id: 2, StudentId: 3, HostelId: 1, CheckInTime: 11/12/2015 12:00:00 AM, CheckOutTime: 11/12/2015 12:00:00 AM

Get students who settled after January 1, 2016

Get commandants with names containing the letter "a".

Id: 1, Name: Adriy, Age: 40, Experience: 5, Gender: Male

Id: 2, Name: Olena, Age: 45, Experience: 1, Gender: Female

Id: 3, Name: Sophia, Age: 60, Experience: 23, Gender: Female

Id: 4, Name: Oksana, Age: 70, Experience: 4, Gender: Female

Id: 5, Name: Maxik, Age: 43, Experience: 14, Gender: Male

Get hostels with more female students than male students.

Get settlements overlapping December 1, 2015, to January 1, 2016.

Id: 1, StudentId: 2, HostelId: 3, CheckInTime: 12/13/2015 12:00:00 AM, CheckOutTime: 1/13/2016 12:00:00 AM

Id: 4, StudentId: 4, HostelId: 3, CheckInTime: 3/13/2015 12:00:00 AM, CheckOutTime: 4/13/2016 12:00:00 AM

Id: 5, StudentId: 5, HostelId: 1, CheckInTime: 5/13/2015 12:00:00 AM, CheckOutTime: 7/13/2016 12:00:00 AM

Get students from hostels with even IDs.

Id: 1, Name: Joe, Faculty: FICT, Cathedra: IPI, Course: 1, Gender: Male, YearOfBirth: 2006

Get experienced commandants with more than 10 years of experience.

Id: 3, Name: Sophia, Age: 60, Experience: 23, Gender: Female

Id: 5, Name: Maxik, Age: 43, Experience: 14, Gender: Male

Get hostels with the letter "o" in their address.

Id: 1, Address: Boholubova, AmountOfRooms: 200, CommandantId: 5

Id: 2, Address: Retardova, AmountOfRooms: 250, CommandantId: 4

Id: 3, Address: Politehnichna, AmountOfRooms: 140, CommandantId: 3

Id: 5, Address: Simonova, AmountOfRooms: 800, CommandantId: 1

Get settlements with a duration of exactly 30 days.

Get students along with their commandants.

Student: Joe, Commandant: Oksana

Student: Nadiya, Commandant: Sophia

Student: Alexandr, Commandant: Maxik

Student: Myhailo, Commandant: Sophia

Student: Oksana, Commandant: Maxik

Get the average age of students in each hostel.

HostelId: 2, AverageAge: 18

HostelId: 3, AverageAge: 19

HostelId: 1, AverageAge: 20.5

Get names of students in hostels with capacities greater than 200.

StudentName: Joe

Get settlements with a duration less than 90 days.

Id: 2, StudentId: 3, HostelId: 1, CheckInTime: 11/12/2015 12:00:00 AM, CheckOutTime: 11/12/2015 12:00:00 AM

Вигляд при зчитуванні завдяки XDocument


```
<Data>
    <Commandants>
        <Id>1</Id>
        <Name>Adriy</Name>
        <Age>40</Age>
        <Experience>5</Experience>
```

```
        <Gender>Male</Gender>
    </Commandants>
    <Commandants>
        <Id>2</Id>
        <Name>Olena</Name>
        <Age>45</Age>
        <Experience>1</Experience>
        <Gender>Female</Gender>
    </Commandants>
    <Commandants>
        <Id>3</Id>
        <Name>Sophia</Name>
        <Age>60</Age>
        <Experience>23</Experience>
        <Gender>Female</Gender>
    </Commandants>
    <Commandants>
        <Id>4</Id>
        <Name>Oksana</Name>
        <Age>70</Age>
        <Experience>4</Experience>
        <Gender>Female</Gender>
    </Commandants>
    <Commandants>
        <Id>5</Id>
        <Name>Maxik</Name>
        <Age>43</Age>
        <Experience>14</Experience>
        <Gender>Male</Gender>
    </Commandants>
```

```
<Studnets>
    <Id>1</Id>
    <Name>Joe</Name>
    <Faculty>FICT</Faculty>
    <Cathedra>IPI</Cathedra>
    <Course>1</Course>
    <Gender>Male</Gender>
    <YearOfBirth>2006</YearOfBirth>
</Studnets>
<Studnets>
    <Id>2</Id>
    <Name>Nadiya</Name>
    <Faculty>FICT</Faculty>
    <Cathedra>IPI</Cathedra>
    <Course>1</Course>
    <Gender>Female</Gender>
    <YearOfBirth>2006</YearOfBirth>
</Studnets>
<Studnets>
    <Id>3</Id>
    <Name>Alexandr</Name>
    <Faculty>FICT</Faculty>
    <Cathedra>IPI</Cathedra>
    <Course>2</Course>
    <Gender>Male</Gender>
    <YearOfBirth>2005</YearOfBirth>
</Studnets>
<Studnets>
    <Id>4</Id>
    <Name>Myhailo</Name>
```

```
        <Faculty>FICT</Faculty>
        <Cathedra>IPI</Cathedra>
        <Course>2</Course>
        <Gender>Male</Gender>
        <YearOfBirth>2004</YearOfBirth>
    </Studnets>
    <Studnets>
        <Id>5</Id>
        <Name>Oksana</Name>
        <Faculty>FICT</Faculty>
        <Cathedra>OT</Cathedra>
        <Course>3</Course>
        <Gender>Female</Gender>
        <YearOfBirth>2002</YearOfBirth>
    </Studnets>
    <Hostels>
        <Id>1</Id>
        <Address>Boholubova</Address>
        <AmountOfRooms>200</AmountOfRooms>
        <CommandantId>5</CommandantId>
    </Hostels>
    <Hostels>
        <Id>2</Id>
        <Address>Retardova</Address>
        <AmountOfRooms>250</AmountOfRooms>
        <CommandantId>4</CommandantId>
    </Hostels>
    <Hostels>
        <Id>3</Id>
        <Address>Politehnichna</Address>
```

```
        <AmountOfRooms>140</AmountOfRooms>
        <CommandantId>3</CommandantId>
    </Hostels>
    <Hostels>
        <Id>4</Id>
        <Address>Knushna</Address>
        <AmountOfRooms>600</AmountOfRooms>
        <CommandantId>2</CommandantId>
    </Hostels>
    <Hostels>
        <Id>5</Id>
        <Address>Simonova</Address>
        <AmountOfRooms>800</AmountOfRooms>
        <CommandantId>1</CommandantId>
    </Hostels>
    <Settlements>
        <Id>1</Id>
        <StudentId>2</StudentId>
        <HostelId>3</HostelId>
        <CheckInTime>2015-12-13T00:00:00</CheckInTime>
        <CheckOutTime>2016-01-13T00:00:00</CheckOutTime>
    </Settlements>
    <Settlements>
        <Id>2</Id>
        <StudentId>3</StudentId>
        <HostelId>1</HostelId>
        <CheckInTime>2015-11-12T00:00:00</CheckInTime>
        <CheckOutTime>2015-11-12T00:00:00</CheckOutTime>
    </Settlements>
    <Settlements>
```

```
        <Id>3</Id>
        <StudentId>1</StudentId>
        <HostelId>2</HostelId>
        <CheckInTime>2015-01-01T00:00:00</CheckInTime>
        <CheckOutTime>2015-02-01T00:00:00</CheckOutTime>
    </Settlements>
    <Settlements>
        <Id>4</Id>
        <StudentId>4</StudentId>
        <HostelId>3</HostelId>
        <CheckInTime>2015-03-13T00:00:00</CheckInTime>
        <CheckOutTime>2016-04-13T00:00:00</CheckOutTime>
    </Settlements>
    <Settlements>
        <Id>5</Id>
        <StudentId>5</StudentId>
        <HostelId>1</HostelId>
        <CheckInTime>2015-05-13T00:00:00</CheckInTime>
        <CheckOutTime>2016-07-13T00:00:00</CheckOutTime>
    </Settlements>
</Data>
```


Приклад використання серіалайзеру

Data serialized and saved to XML file successfully.

Commandants:

1, John, 40, 5, Male

2, Alice, 35, 8, Female

Hostels:

1, 123 Main St, 50, 1

2, 456 Elm St, 40, 2

Students:

1, John, FIOT, IPI, 2, Male, 2005

2, Olya, FIOT, OT, 4, Female, 2001

Settlements:

1, 1, 1, 4/30/2024 1:19:52 PM, 5/30/2024 1:19:52 PM

2, 2, 2, 4/30/2024 1:19:52 PM, 6/30/2024 1:19:52 PM