Lab 3: Tìm hiểu và cài đặt nhóm mẫu Structural (tt)(5 tiết)

Yêu cầu:

- Sinh viên đọc hiểu rõ mục đích, ý nghĩa và áp dụng ứng dụng của nhóm mẫu cấu trúc.
- Sử dụng Visual Studio cài đặc nhóm mẫu trên.
- Nộp bài báo cáo: Mỗi parttern hãy lấy 2 ví dụ thể hiện bằng sơ đồ lớp (Class diagram)

Structural Patterns:

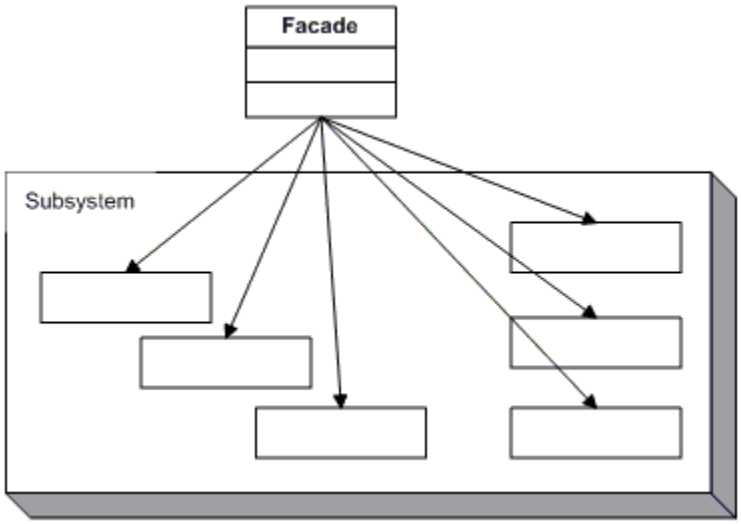
Adapter	Match interfaces of different classes
Bridge	Separates an object's interface from its implementation
Composite	A tree structure of simple and composite objects
Decorator	Add responsibilities to objects dynamically
Facade	A single class that represents an entire subsystem
Flyweight	A fine-grained instance used for efficient sharing
Proxy	An object representing another object

1. Facade

Definition

Provide a unified interface to a set of interfaces in a subsystem. Façade defines a higher-level interface that makes the subsystem easier to use.

UML class diagram



Participants

The classes and/or objects participating in this pattern are:

- **Facade (MortgageApplication)**
  - knows which subsystem classes are responsible for a request.
  - delegates client requests to appropriate subsystem objects.
- **Subsystem classes (Bank, Credit, Loan)**
  - implement subsystem functionality.
  - handle work assigned by the Facade object.
  - have no knowledge of the facade and keep no reference to it.

Sample code in C#

This structural code demonstrates the Facade pattern which provides a simplified and uniform interface to a large subsystem of classes.

```
// Facade pattern -- Structural example

using System;

namespace DoFactory.GangOfFour.Facade.Structural
{
  /// <summary>
  /// MainApp startup class for Structural
  /// Facade Design Pattern.
  /// </summary>
  class MainApp
  {
    /// <summary>
    /// Entry point into console application.
    /// </summary>
    public static void Main()
    {
      Facade facade = new Facade();
```

```
    facade.MethodA();
    facade.MethodB();

    // Wait for user
    Console.ReadKey();
  }
}

/// <summary>
/// The 'Subsystem ClassA' class
/// </summary>
class SubSystemOne
{
  public void MethodOne()
  {
    Console.WriteLine(" SubSystemOne Method");
  }
}

/// <summary>
/// The 'Subsystem ClassB' class
/// </summary>
class SubSystemTwo
{
  public void MethodTwo()
  {
    Console.WriteLine(" SubSystemTwo Method");
  }
}

/// <summary>
/// The 'Subsystem ClassC' class
/// </summary>
class SubSystemThree
{
  public void MethodThree()
  {
    Console.WriteLine(" SubSystemThree Method");
  }
}

/// <summary>
/// The 'Subsystem ClassD' class
/// </summary>
class SubSystemFour
{
  public void MethodFour()
  {
    Console.WriteLine(" SubSystemFour Method");
  }
```

```
}

/// <summary>
/// The 'Facade' class
/// </summary>
class Facade
{
  private SubSystemOne _one;
  private SubSystemTwo _two;
  private SubSystemThree _three;
  private SubSystemFour _four;

  public Facade()
  {
    _one = new SubSystemOne();
    _two = new SubSystemTwo();
    _three = new SubSystemThree();
    _four = new SubSystemFour();
  }

  public void MethodA()
  {
    Console.WriteLine("\nMethodA() ---- ");
    _one.MethodOne();
    _two.MethodTwo();
    _four.MethodFour();
  }

  public void MethodB()
  {
    Console.WriteLine("\nMethodB() ---- ");
    _two.MethodTwo();
    _three.MethodThree();
  }
 }
}
```

Output

```
MethodA() ----
SubSystemOne Method
SubSystemTwo Method
SubSystemFour Method

MethodB() ----
SubSystemTwo Method
SubSystemThree Method
```

This real-world code demonstrates the Facade pattern as a MortgageApplication object which provides a simplified interface to a large subsystem of classes measuring the creditworthyness of an applicant.

```
// Facade pattern -- Real World example

using System;

namespace DoFactory.GangOfFour.Facade.RealWorld
{
  /// <summary>
  /// MainApp startup class for Real-World
  /// Facade Design Pattern.
  /// </summary>
  class MainApp
  {
    /// <summary>
    /// Entry point into console application.
    /// </summary>
    static void Main()
    {
      // Facade
      Mortgage mortgage = new Mortgage();

      // Evaluate mortgage eligibility for customer
      Customer customer = new Customer("Ann McKinsey");
      bool eligible = mortgage.IsEligible(customer, 125000);

      Console.WriteLine("\n" + customer.Name +
          " has been " + (eligible ? "Approved" : "Rejected"));

      // Wait for user
      Console.ReadKey();
    }
  }

  /// <summary>
  /// The 'Subsystem ClassA' class
  /// </summary>
  class Bank
  {
    public bool HasSufficientSavings(Customer c, int amount)
    {
      Console.WriteLine("Check bank for " + c.Name);
      return true;
    }
  }

  /// <summary>
  /// The 'Subsystem ClassB' class
  /// </summary>
  class Credit
  {
    public bool HasGoodCredit(Customer c)
    {
```

```
    Console.WriteLine("Check credit for " + c.Name);
    return true;
  }
}

/// <summary>
/// The 'Subsystem ClassC' class
/// </summary>
class Loan
{
  public bool HasNoBadLoans(Customer c)
  {
    Console.WriteLine("Check loans for " + c.Name);
    return true;
  }
}

/// <summary>
/// Customer class
/// </summary>
class Customer
{
  private string _name;

  // Constructor
  public Customer(string name)
  {
    this._name = name;
  }

  // Gets the name
  public string Name
  {
    get { return _name; }
  }
}

/// <summary>
/// The 'Facade' class
/// </summary>
class Mortgage
{
  private Bank _bank = new Bank();
  private Loan _loan = new Loan();
  private Credit _credit = new Credit();

  public bool IsEligible(Customer cust, int amount)
  {
    Console.WriteLine("{0} applies for {1:C} loan\n",
      cust.Name, amount);
```

```
    bool eligible = true;

    // Check creditworthyness of applicant
    if (!_bank.HasSufficientSavings(cust, amount))
    {
      eligible = false;
    }
    else if (!_loan.HasNoBadLoans(cust))
    {
      eligible = false;
    }
    else if (!_credit.HasGoodCredit(cust))
    {
      eligible = false;
    }

    return eligible;
  }
 }
}
```

Output

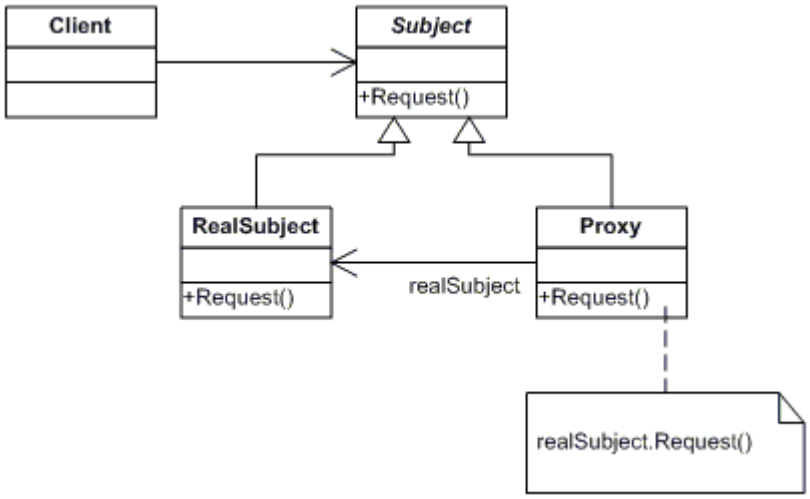
```
Ann McKinsey applies for $125,000.00 loan

Check bank for Ann McKinsey
Check loans for Ann McKinsey
Check credit for Ann McKinsey

Ann McKinsey has been Approved
```

2. Proxy

Definition

Provide a surrogate or placeholder for another object to control access to it.

UML class diagram



Participants

The classes and/or objects participating in this pattern are:

- **Proxy (MathProxy)**
  - maintains a reference that lets the proxy access the real subject. Proxy may refer to a Subject if the RealSubject and Subject interfaces are the same.
  - provides an interface identical to Subject's so that a proxy can be substituted for for the real subject.
  - controls access to the real subject and may be responsible for creating and deleting it.
  - other responsibilites depend on the kind of proxy:
    - *remote proxies* are responsible for encoding a request and its arguments and for sending the encoded request to the real subject in a different address space.
    - *virtual proxies* may cache additional information about the real subject so that they can postpone accessing it. For example, the ImageProxy from the Motivation caches the real images's extent.
    - *protection proxies* check that the caller has the access permissions required to perform a request.
- **Subject (IMath)**
  - defines the common interface for RealSubject and Proxy so that a Proxy can be used anywhere a RealSubject is expected.
- **RealSubject (Math)**
  - defines the real object that the proxy represents.

Sample code in C#

This structural code demonstrates the Proxy pattern which provides a representative object (proxy) that controls access to another similar object.

```
// Proxy pattern -- Structural example

using System;

namespace DoFactory.GangOfFour.Proxy.Structural
```

```
{
 /// <summary>
 /// MainApp startup class for Structural
 /// Proxy Design Pattern.
 /// </summary>
 class MainApp
 {
  /// <summary>
  /// Entry point into console application.
  /// </summary>
  static void Main()
  {
   // Create proxy and request a service
   Proxy proxy = new Proxy();
   proxy.Request();

   // Wait for user
   Console.ReadKey();
  }
 }

 /// <summary>
 /// The 'Subject' abstract class
 /// </summary>
 abstract class Subject
 {
  public abstract void Request();
 }

 /// <summary>
 /// The 'RealSubject' class
 /// </summary>
 class RealSubject : Subject
 {
  public override void Request()
  {
   Console.WriteLine("Called RealSubject.Request()");
  }
 }

 /// <summary>
 /// The 'Proxy' class
 /// </summary>
 class Proxy : Subject
 {
  private RealSubject _realSubject;

  public override void Request()
  {
   // Use 'lazy initialization'
   if (_realSubject == null)
```

```
    {
      _realSubject = new RealSubject();
    }

    _realSubject.Request();
  }
 }
}
```

Output

```
Called RealSubject.Request()
```

This real-world code demonstrates the Proxy pattern for a Math object represented by a MathProxy object.

```
// Proxy pattern -- Real World example

using System;

namespace DoFactory.GangOfFour.Proxy.RealWorld
{
 /// <summary>
 /// MainApp startup class for Real-World
 /// Proxy Design Pattern.
 /// </summary>
 class MainApp
 {
  /// <summary>
  /// Entry point into console application.
  /// </summary>
  static void Main()
  {
   // Create math proxy
   MathProxy proxy = new MathProxy();

   // Do the math
   Console.WriteLine("4 + 2 = " + proxy.Add(4, 2));
   Console.WriteLine("4 - 2 = " + proxy.Sub(4, 2));
   Console.WriteLine("4 * 2 = " + proxy.Mul(4, 2));
   Console.WriteLine("4 / 2 = " + proxy.Div(4, 2));

   // Wait for user
   Console.ReadKey();
  }
 }

 /// <summary>
 /// The 'Subject interface
 /// </summary>
```

```
public interface IMath
{
  double Add(double x, double y);
  double Sub(double x, double y);
  double Mul(double x, double y);
  double Div(double x, double y);
}

/// <summary>
/// The 'RealSubject' class
/// </summary>
class Math : IMath
{
  public double Add(double x, double y) { return x + y; }
  public double Sub(double x, double y) { return x - y; }
  public double Mul(double x, double y) { return x * y; }
  public double Div(double x, double y) { return x / y; }
}

/// <summary>
/// The 'Proxy Object' class
/// </summary>
class MathProxy : IMath
{
  private Math _math = new Math();

  public double Add(double x, double y)
  {
    return _math.Add(x, y);
  }
  public double Sub(double x, double y)
  {
    return _math.Sub(x, y);
  }
  public double Mul(double x, double y)
  {
    return _math.Mul(x, y);
  }
  public double Div(double x, double y)
  {
    return _math.Div(x, y);
  }
 }
}
```

Output

```
4 + 2 = 6
4 - 2 = 2
4 * 2 = 8
4 / 2 = 2
```