Chain of Responsibility

You don't have to know everyone.
You just need to know one person
and you will get your answer!

Intent

- Decouple the sender of a request to its receiver
- Chain the receivers
- Pass the request along the chain so that a receiver in the chain handles it

General idea:

A single request initiated by a client to a multiple handler objects. The first handler in the chain receives the request. It either processes it or forwards it to the next one (successor) in the chain.
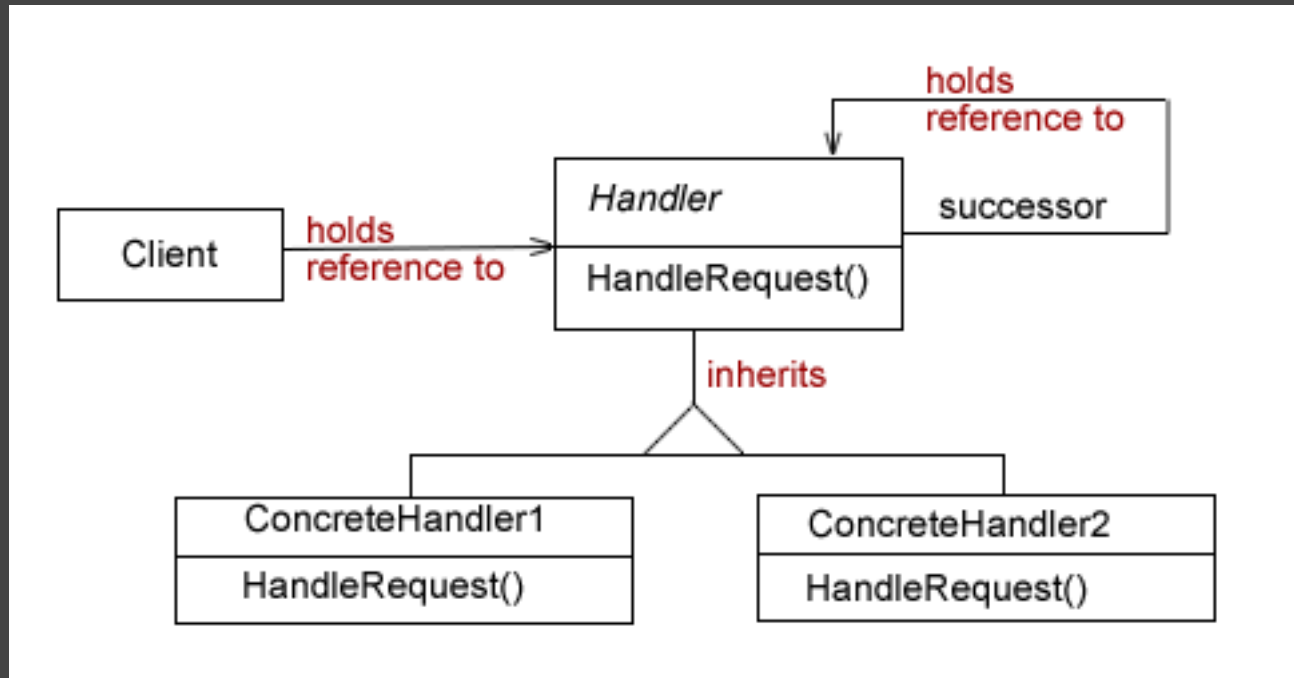
Properties of the design pattern

- Request is processed by only one handler object

- The current handler is responsible for the determination of processing the request
  - If the current handler object is able to process the request, then request will be processed in the current handler.
  - Otherwise, the current handler object forwards the request to the next chain handler object.

- Request is passed on until the request is processed or there is no more successor to handle it.
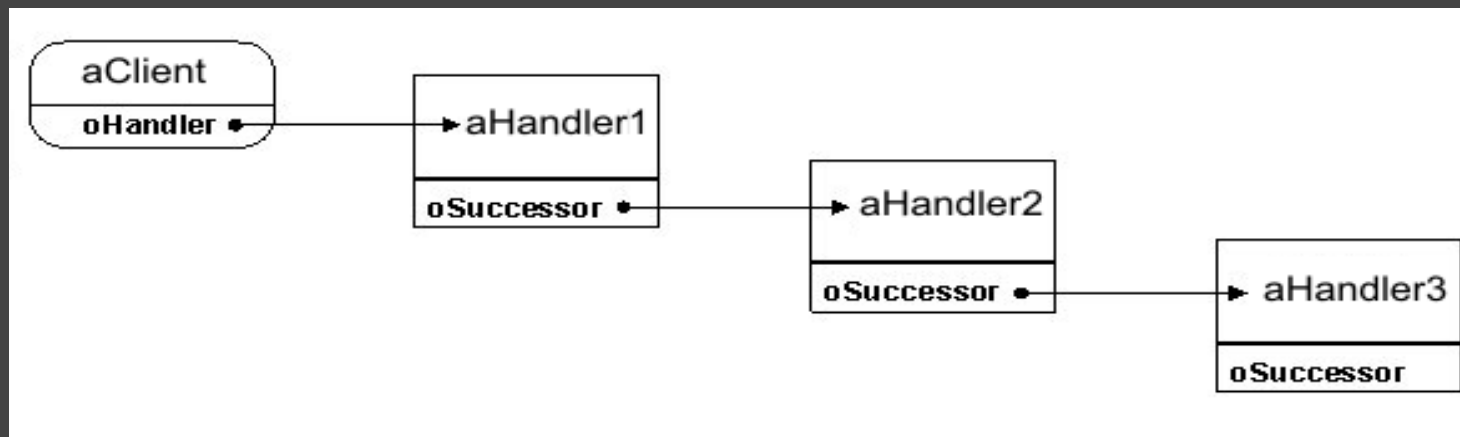
Participants: 3 main players

- Handler
  - defines interface for handling request
  - implements the successor link

- ConcreteHandler
  - implements the handling request that it is responsible for
  - has access to the succesor

- Client
  - initiates the request to the first ConcreteHandler in the chain

Structure: UML diagram

Typical structure looks like this:

When do you use it?

- Multiple objects can handle a request and the handler is not predetermined

- Request has to be issued to several objects without specifying the receiver explicitly

- A set of objects should be able to handle a request and the handler is determined at runtime

Example

You work for a homeland security and you need to build a warning system that determines the risk depending on the severity of the terrorist attack

```vbnet
''' <summary>
''' Class that    holds request details
''' </summary>
Public Class Terrorist
    Private mName As String = String.Empty
    Private mAction As ActionCommitted = Nothing

    'Represents the terrorist actions
    Public Enum ActionCommitted
        Crash_Airplane_To_The_World_Trade_Center = 1
        Build_Weapons_of_Mass_Destruction = 2
        Fire_Nuclear_Bomb = 3
    End Enum

    'constructor
    Public Sub New(ByVal terroristName As String, _
                   ByVal terroristAction As Terrorist.ActionCommitted)

        mName = terroristName
        mAction = terroristAction
    End Sub

    'Name of the terrorist
    Public ReadOnly Property Name() As String
        Get
            Return mName
        End Get
    End Property

    'Terrorist action
    Public ReadOnly Property Action() As String
        Get
            Return mAction
        End Get
    End Property
End Class
```

```vb
''' <summary>
''' This is the 'Handler' class
''' </summary>
''' <remarks></remarks>
Public MustInherit Class HomelandSecurity

    'has access to the succesrror
    Protected mSuccessor As HomelandSecurity = Nothing

    'handling request
    Public MustOverride Sub Warn(ByVal terrorist As Terrorist)

    'set the successor
    Public Sub setSuccessor(ByVal successor As HomelandSecurity)
        If successor IsNot Nothing Then
            mSuccessor = successor
        End If
    End Sub

End Class
```

```vbnet
''' 'ConcreteHandler' class
''' </summary>
Public Class LowRisk
    Inherits HomelandSecurity

    ''' <summary>
    ''' handle request
    ''' </summary>
    Public Overrides Sub Warn(ByVal terrorist As Terrorist)

        If terrorist.Action = terrorist.ActionCommitted.Crash_Airplane_To_The_World_Trade_Center Then
            'Handle request
            Console.WriteLine("Low risk warning has been issued because " _
                            & terrorist.Name _
                            & " committed following terrorist action: " _
                            & "Crash Airplane into the World Trade Center!")
            Console.WriteLine()
        Else
            'cannot handle so forward it to the successor
            If Me.mSuccessor IsNot Nothing Then
                Me.mSuccessor.Warn(terrorist)
            End If
        End If

    End Sub

End Class
```

```vb
''' <summary>
''' 'ConcreteHandler' class
''' </summary>
Public Class MediumRisk
    Inherits HomelandSecurity

    ''' <summary>
    ''' handle request
    ''' </summary>
    Public Overrides Sub Warn(ByVal terrorist As Terrorist)

        If terrorist.Action = terrorist.ActionCommitted.Build_Weapons_of_Mass_Destruction Then
            'Handle request
            Console.WriteLine("Medium risk warning has been issued because " _
                              & terrorist.Name _
                              & " committed following terrorist action: " _
                              & "Build weapons of mass destruction")
            Console.WriteLine()
        Else
            'cannot handle so forward it to the successor
            If Me.mSuccessor IsNot Nothing Then
                Me.mSuccessor.Warn(terrorist)
            End If
        End If

    End Sub
```

```vbnet
''' <summary>
''' 'ConcreteHandler' class
''' </summary>
Public Class HighRisk
    Inherits HomelandSecurity

    |

    ''' <summary>
    ''' handle request
    ''' </summary>
    Public Overrides Sub Warn(ByVal terrorist As Terrorist)

        If terrorist.Action = terrorist.ActionCommitted.Fire_Nuclear_Bomb Then
            'Handle request
            Console.WriteLine("High risk warning has been issued because " _
                                & terrorist.Name _
                                & " committed following terrorist action: " _
                                & "Build weapons of mass destruction")
            Console.WriteLine()
        Else
            'cannot handle so forward it to the successor
            If Me.mSuccessor IsNot Nothing Then
                Me.mSuccessor.Warn(terrorist)
            End If
        End If

    End Sub
```

```vbnet
Module WarningModule

    Sub Main()

        'setup chain of responsibility
        Dim lowRisk As HomelandSecurity = New LowRisk
        Dim mediumRisk As HomelandSecurity = New MediumRisk
        Dim highRisk As HomelandSecurity = New HighRisk
        lowRisk.setSuccessor(mediumRisk)
        mediumRisk.setSuccessor(highRisk)

        'generate client and process request
        Dim BinLaden As New Terrorist("Osama Bin Laden", _
                                      Terrorist.ActionCommitted.Crash_Airplane_To_The_World_Trade_Center)
        lowRisk.Warn(BinLaden)

        'generate another client and process request
        Dim SaddamHussein As New Terrorist("Saddam Hussein", _
                                  Terrorist.ActionCommitted.Build_Weapons_of_Mass_Destruction)
        lowRisk.Warn(SaddamHussein)


        'generate thrid client and process request
        Dim KimJongIl As New Terrorist("Kim Jong-Il", _
                                  Terrorist.ActionCommitted.Fire_Nuclear_Bomb)
        lowRisk.Warn(KimJongIl)

        'Wait for user
        Console.ReadKey()
    End Sub

End Module
```
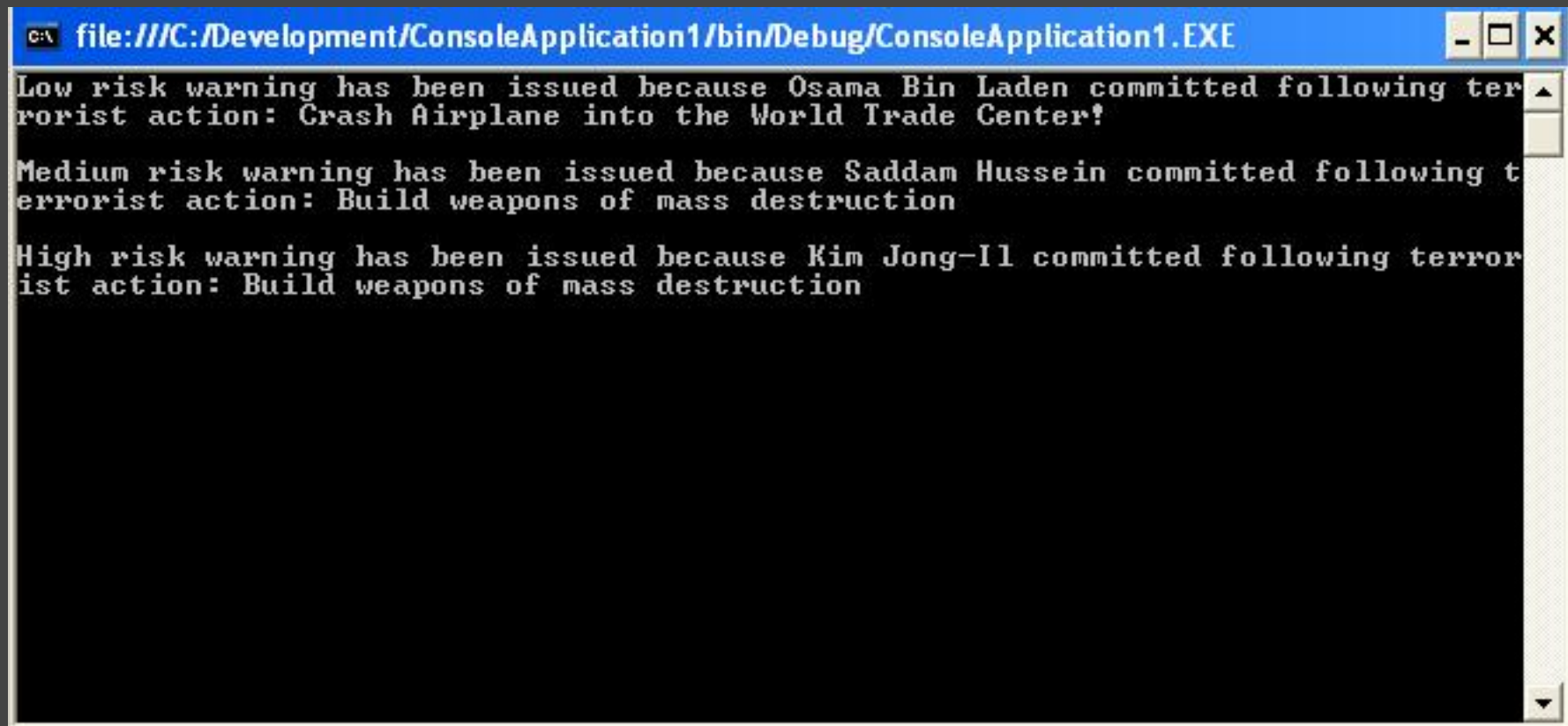
```
Low risk warning has been issued because Osama Bin Laden committed following ter
rorist action: Crash Airplane into the World Trade Center!

Medium risk warning has been issued because Saddam Hussein committed following t
errorist action: Build weapons of mass destruction

High risk warning has been issued because Kim Jong-Il committed following terror
ist action: Build weapons of mass destruction
```