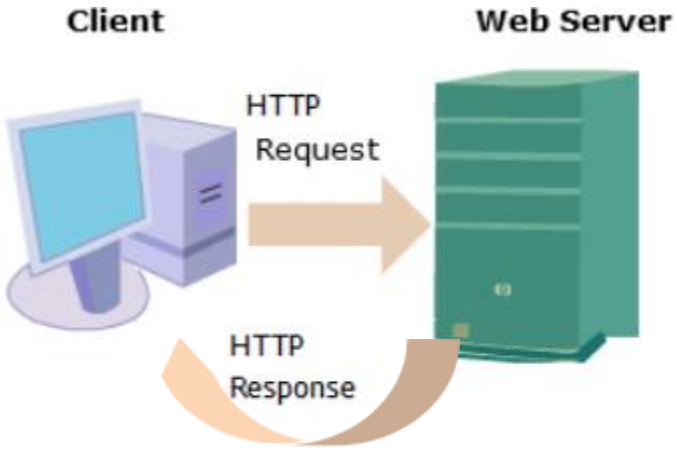
Web API Services

Session 4

HTTP Protocol

- HTTP protocol:
  - Communicates over the Web. When a URL in the Address bar of a browser is typed and submitted, an HTTP request is sent to an application running on a server that is represented by the URL.
  - Returns back a HTTP response. The browser on receiving the response displays the response to you.
  - Provides different types of request methods based on the type of operations that the request needs to make.



HTTP Methods

- The four main HTTP methods are as follows:

GET	POST	PUT	DELETE
• Requests the server to retrieves a resource.	• Requests the server that the target resource should process the data contained in the request.	• Requests the server to create or update a request.	• Requests the server to delete a resource.

REST API

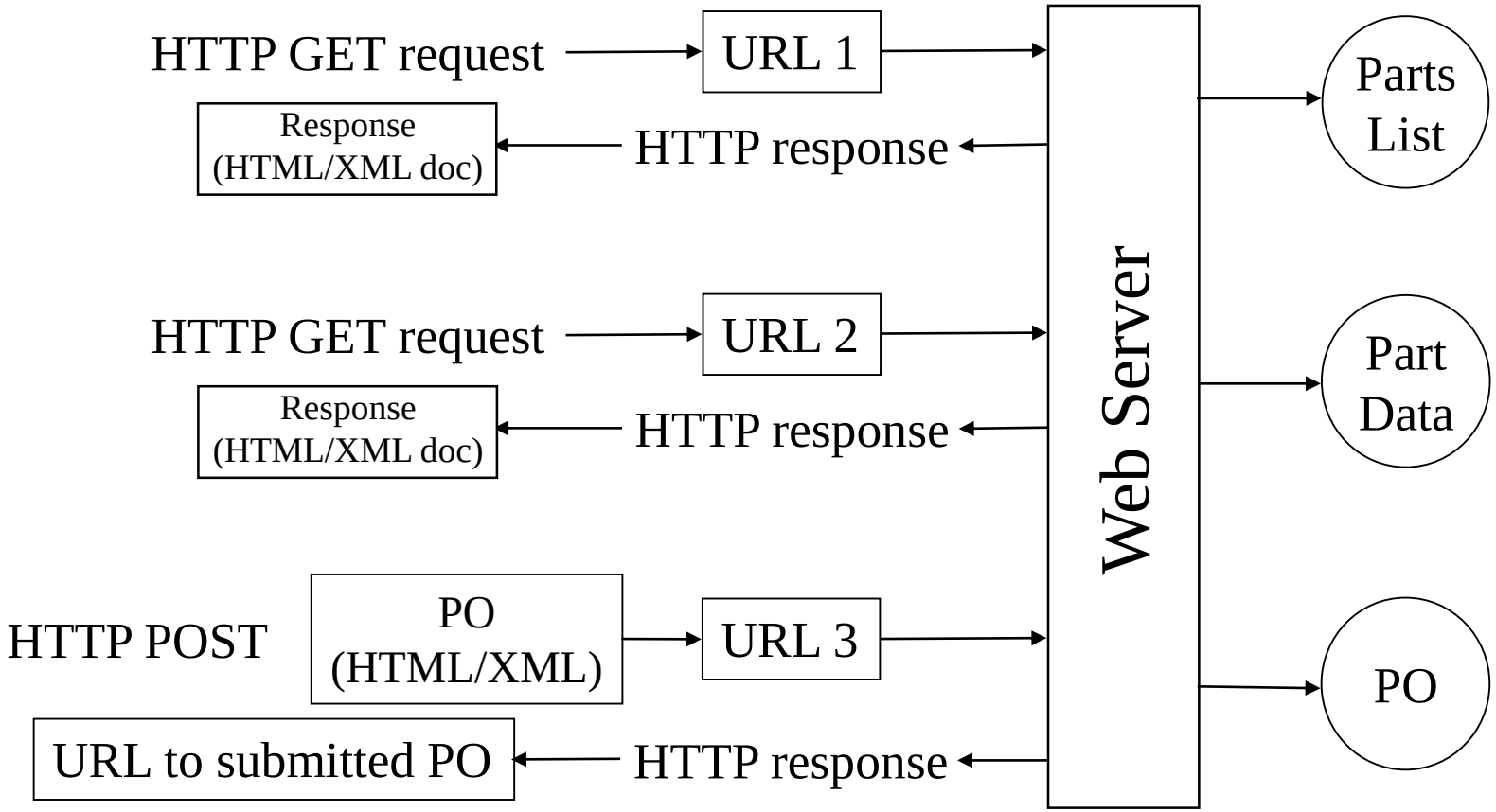
- “REST " was coined by Roy Fielding in his Ph.D. dissertation to describe a design pattern for implementing networked systems

Representational State Transfer

"Representational State Transfer is intended to evoke an image of how a well-designed Web application behaves: a network of web pages (a virtual state-machine), where the user progresses through an application by selecting links (state transitions), resulting in the next page (representing the next state of the application) being transferred to the user and rendered for their use."

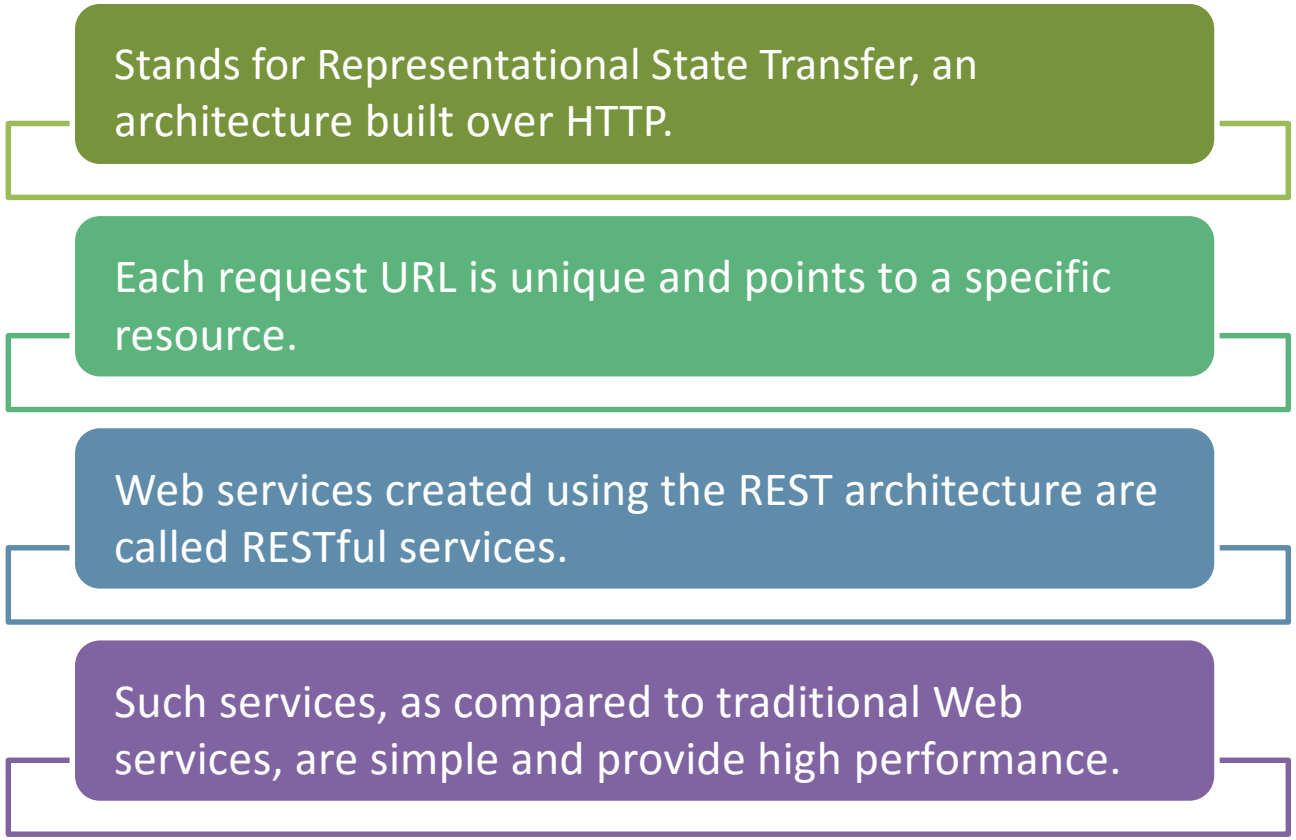
- Roy Fielding

The REST way of Designing the Web Services



REST 1-4

- REST:


Stands for Representational State Transfer, an architecture built over HTTP.
Each request URL is unique and points to a specific resource.
Web services created using the REST architecture are called RESTful services.
Such services, as compared to traditional Web services, are simple and provide high performance.

REST 2-4

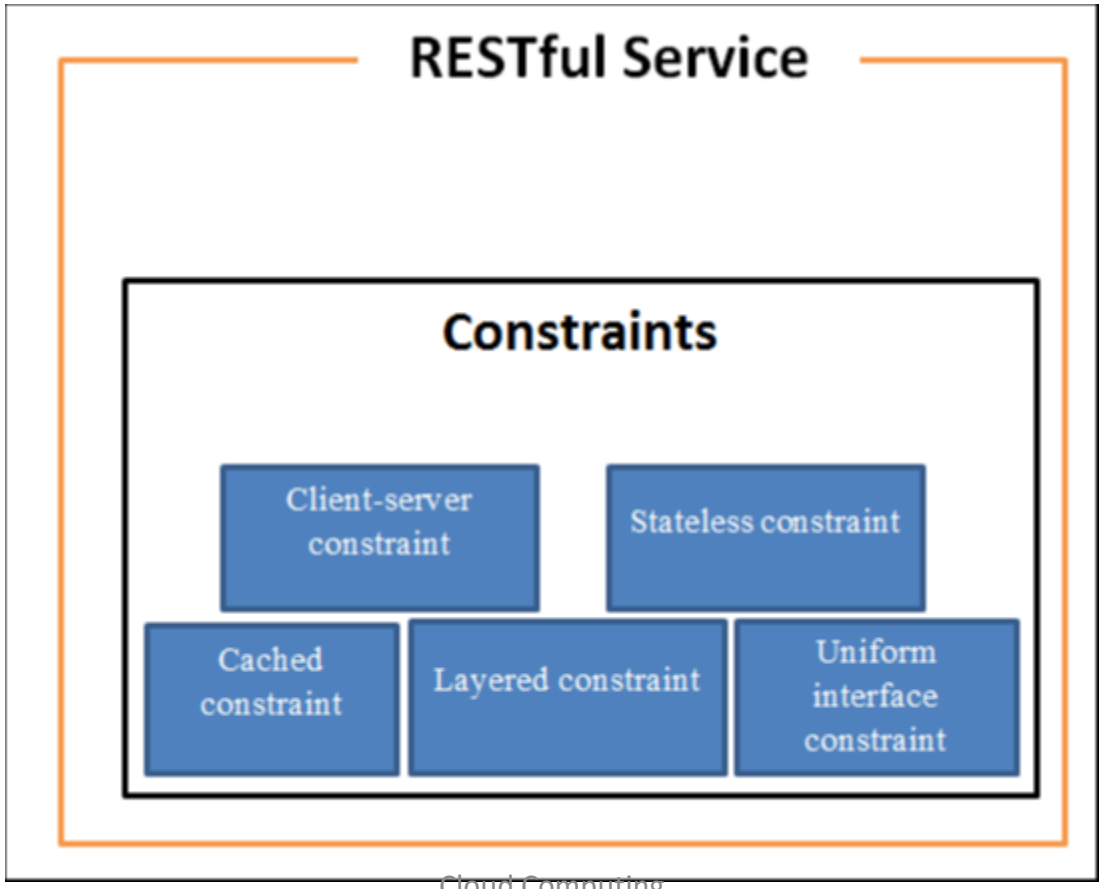
- To create RESTful services, you need to address the following basic design principles:

Explicitly and consistently use the **HTTP methods** to interact with services. For example, use the **GET** HTTP method to retrieve a resource use GET and the **POST** HTTP method to create a resource.	HTTP is **stateless** and therefore, each HTTP request should be created with all the information required by the server to generate the response.	URLs should only be used to access resources of a RESTful service. These **URLs should be consistent and intuitive.**	The **XML and JSON** data format must be supported for request/response exchange between clients and the RESTful service.

- For a Web service to qualify as a RESTful service, the service has to conform to certain defined constraints.

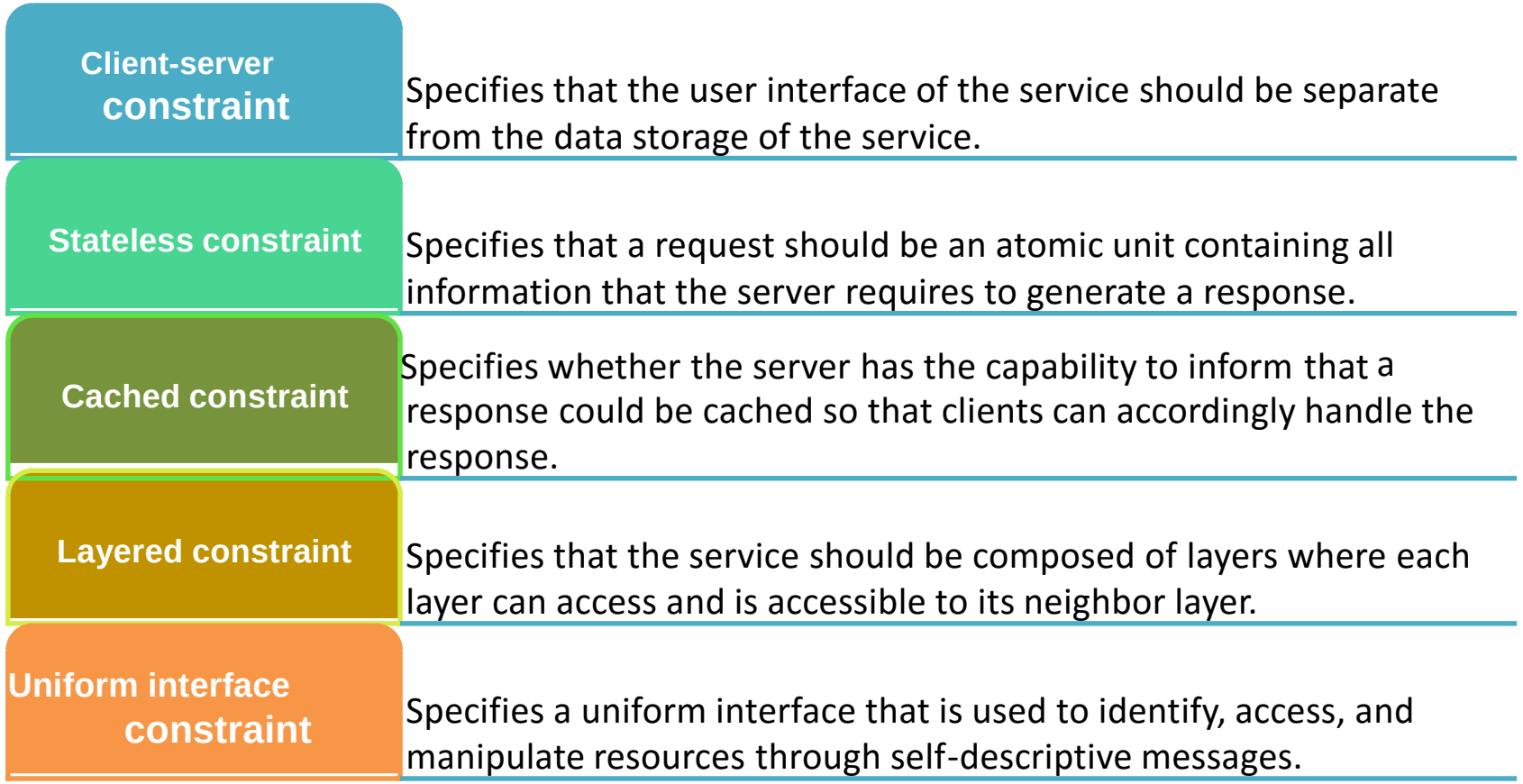
REST 3-4

- Following figure illustrates the mandatory constraints for a Web service to qualify as a RESTful service:



REST 4-4

- The various terms shown in the figure are explained as follows:



HTTP

Verb	URI or template	Use
POST	/order	Create a new order, and upon success, receive a Location header specifying the new order's URI.
GET	/order/{orderId}	Request the current state of the order specified by the URI.
PUT	/order/{orderId}	Update an order at the given URI with new information, providing the full representation.
DELETE	/order/{orderId}	Logically remove the order identified by the given URI.

Designing and implementing Web API Services

Designing and implementing Web API Services

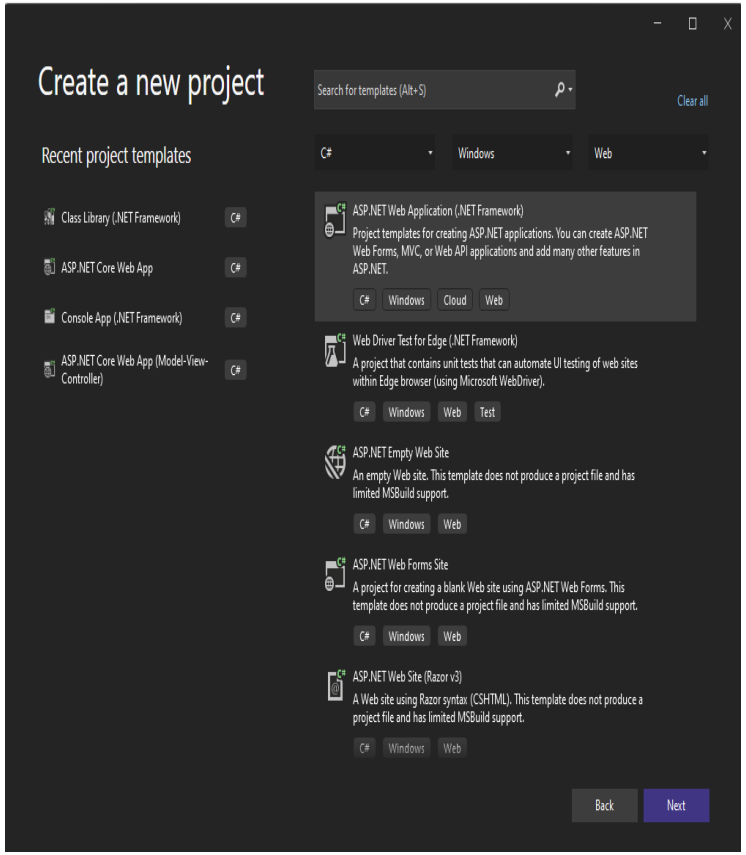
- Visual Studio provides templates and tools to simplify developing ASP.NET Web API services.

- When you create an ASP.NET Web API service in Visual Studio, the Integrated Development Environment (IDE):
  - Creates a skeleton application with a default directory structure.
  - Contains the basic ASP.NET Web API components, such as a controller, route configurations, and the reference libraries.
  - Adds the required services based on the application requirements.
  - Debugs and tests the application before finally hosting it to a production server.

Creating an ASP.NET Web API Application

- To create a new ASP.NET Web API application in Visual Studio, you need to perform the following steps:

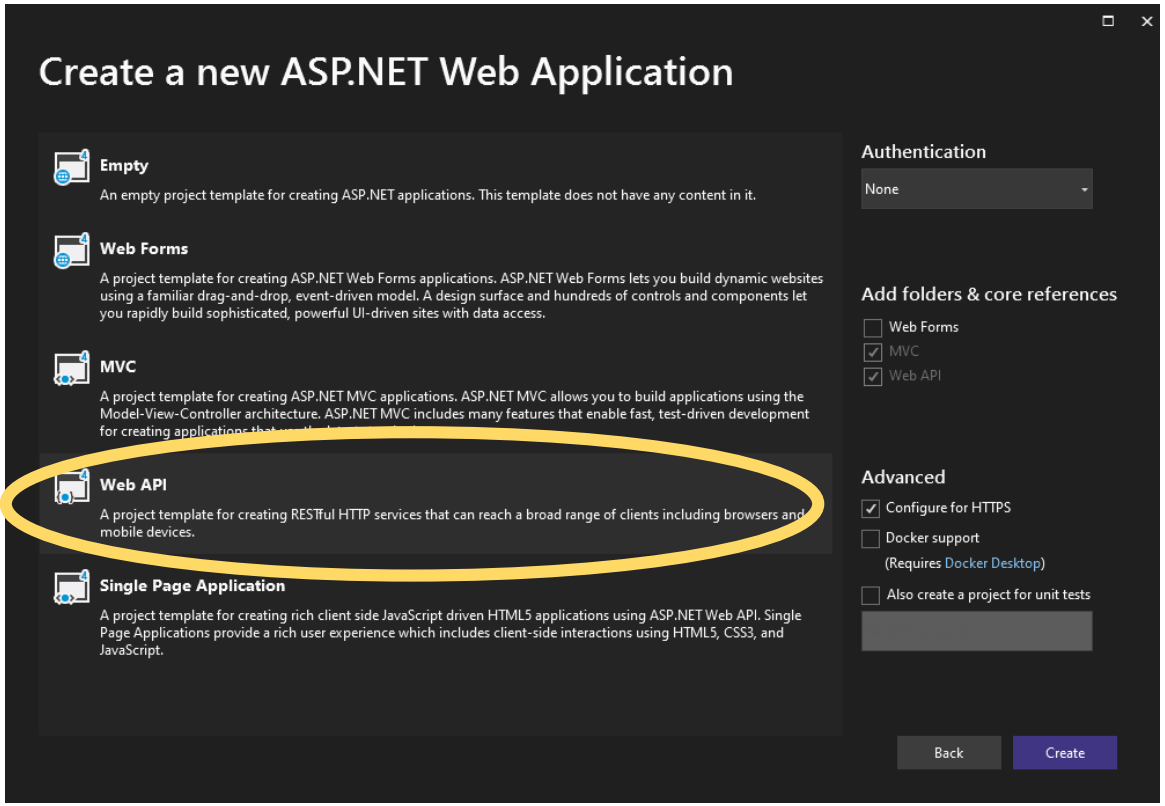
Step 1	• Open Visual Studio .
Step 2	• Click **File** → **New** → **Project** in Visual Studio .
Step 3	• In the **New Project** dialog box that appears, select **Web** under the **Installed** section, and then select the **ASP.NET Web Application** template.
Step 4	• Type **WebAPIDemo** in the **Name** text field.
Step 5	• Click **Browse** in the dialog box and specify the location where the application has to be created.
Step 6	• Click **OK**. The **New ASP.NET Project – WebAPIDemo** dialog box is displayed.



Creating an ASP.NET Web API Application

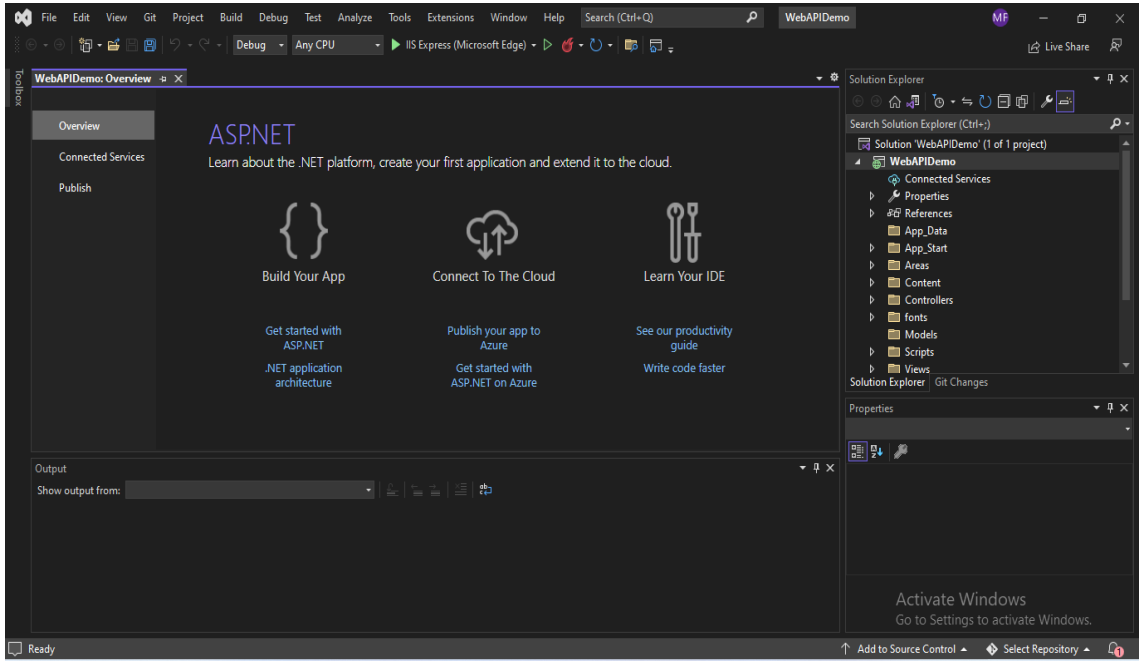
Step 7

Select **Web API** under the **Select a template** section of the **New ASP.NET Project –WebAPIDemo** dialog box.



Step 8

Click **Create**. Visual Studio displays the newly created ASP.NET Web API application.



Adding a Model 1-4

- Once you have created the ASP.NET Web API application, you need to create a model.

- A model in an ASP.NET Web API service represents application specific data.

  - For example, if you are creating a service for online social integration, your service will typically contain a **Profile model** to represent profile information of user, a **Login model** to represent the login information of users, and a **Post model** to represent information that you post online.

Adding a Model 2-4

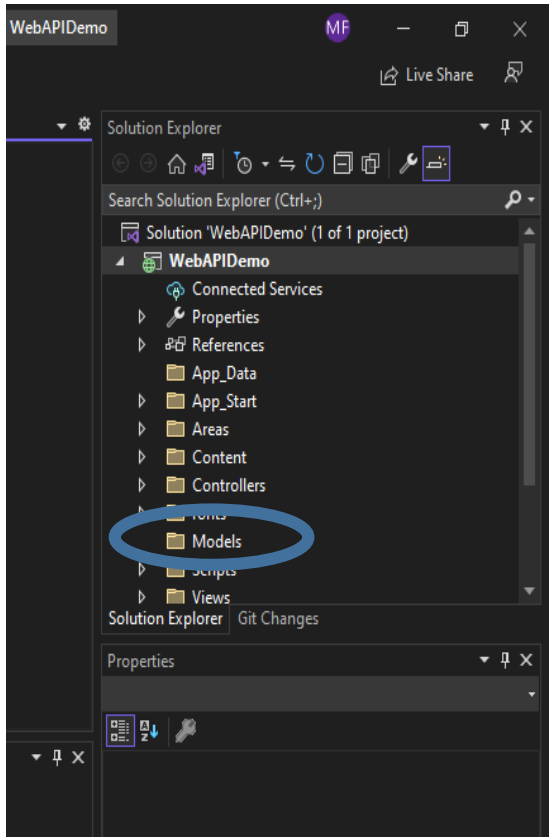
- To create a model in Visual Studio, you need to perform the following steps:

Step 1

Right-click the **Models** folder in the Solution Explorer window and select **Add** → **Class** from the context menu that appears. The **Add New Item – WebAPIDemo** dialog box is displayed.

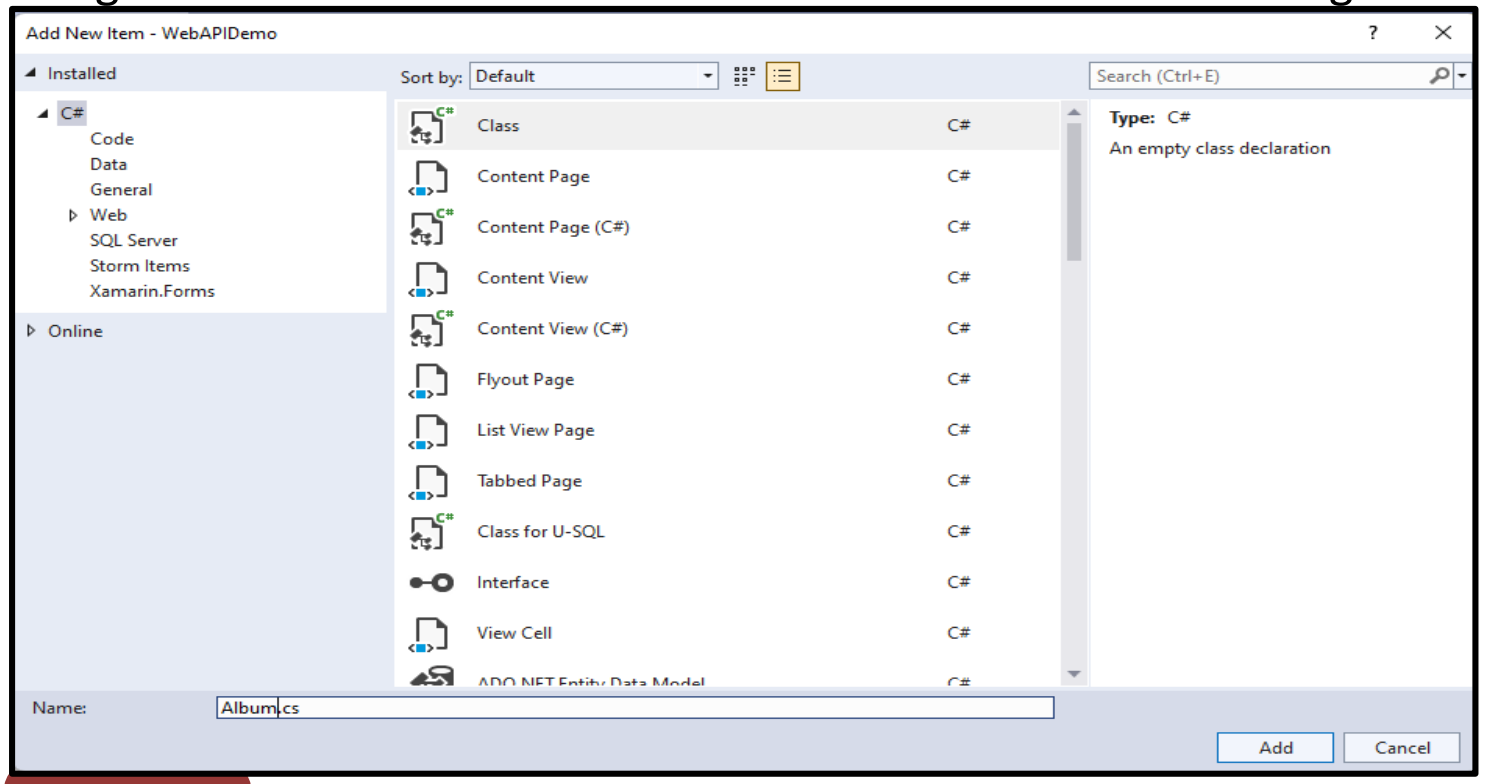
Step 2

Type **Album.cs** in the **Name** text field of the **Add New Item – WebAPIDemo** dialog box.



Adding a Model 3-4

- Figure shows **the Add New Item – WebAPIDemo** dialog box:



Step 3

Click **Add**. The Code Editor displays the newly created **Album** class.

Adding a Model 4-4

Step 4

In Code Editor, add the code shown in the following code snippet to the **Album** class to represent a product.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;
namespace WebAPIDemo.Models
{
    public class Album
    {
    public int Id { get; set; }
    public string Name { get; set; }
    public string Genre { get; set; }
    public decimal Price { get; set; }
    }
}
```

This code declares variables named `Id`, `Name`, `Genre`, and `Price` along with the `get` and `set` methods.

Adding a Repository 1-8

- In an ASP.NET Web API service-based application, a repository is:
  - A data source that stores the data of the application
  - An in-memory application object
  - An XML file
  - A separate Relational Database Management System (RDBMS)
  - A cloud-base storage system

- For the **WebAPIDemo** project, create an in-memory application object as a repository to store a collection of albums. Perform the following steps to create a repository in Visual Studio:

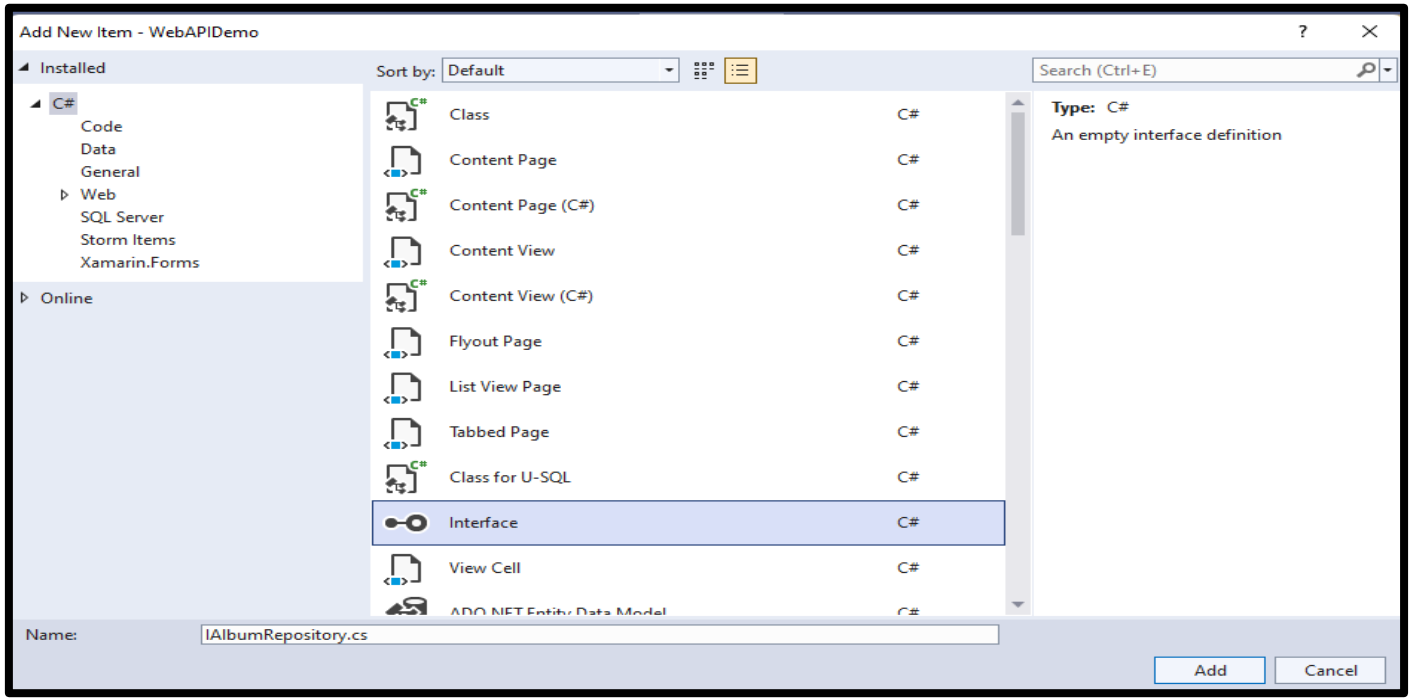
Step 1: Right-click the **Models** folder in Solution Explorer and select **Add → New Item**. The **WebAPIDemo** dialog box is displayed.

Step 2: Select **Visual C#** in the **Templates** pane, and **Interface** on the right of the **Add New Item-WebAPIDemo** dialog box.

Step 3: Type **IAlbumRepository** in the **Name** field.

Adding a Repository 2-8

- Figure shows the process of adding the interface.



Step 4: Click **Add**. The Code Editor displays the newly created **IAlbumRepository** repository.

Adding a Repository 3-8

Step 5: In Code Editor, add the following code to the **IAlbumRepository** repository.

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

namespace WebAPIDemo.Models
{
interface IAlbumRepository
    {
        IEnumerable<Album> GetAll();
        Album Get(int id);
        Album Add(Album item);
        void Remove(int id);
        bool Update(Album item);
    }
}
```

Adding a Repository 4-8

- The code creates an `IAlbumRepository` interface and declares the following methods:

GetAll()	Get(int id)	Add(Album item)	Remove(int id	Update(Album item）
• An implementation of this method should return an `IEnumerable <Album>` object that contains details of all the albums.	• An implementation of this method should return an `Album` object of the specified Id passed as parameters to the method.	• An implementation of this method should add a new `Album` object to the `AlbumRepository` object. Once added, this method should return the new `Album` object.	• An implementation of this method should remove an `Album` object specified by the Id passed as parameter from the `AlbumRepository` object.	• An implementation of this method should update the `AlbumRepository` object with the `Album` object passed as parameter.

Adding a Repository 5-8

Step 6: Similarly, create another class named `AlbumRepository` in the **Models** folder.

Step 7: In the Code Editor, add the code to the `AlbumRepository` class.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace WebAPIDemo.Models
{
  public class AlbumRepository : IAlbumRepository
  {
   private List<Album> albums = new List<Album>();
    private int _nextId = 1;
    public AlbumRepository() {
```

Adding a Repository 6-8

```
    Add(new Album{Name="The Band", Genre="Classic Rock",
        Price=150});
    Add(new Album {Name="The Blueprint", Genre="HipHop",
        Price=200});
    Add(new Album {Name="Unconditional", Genre="Hard Rock",
       Price=175 });
     }
public IEnumerable<Album> GetAll()
{
  return albums;
}
public Album Get(int id)
{
    return albums.Find(p =>p.Id == id);
 }
public Album Add(Album item)
{
if (item == null)
```

Adding a Repository 7-8

```
{
   throw new ArgumentNullException("item");
}
item.Id = _nextId++;
albums.Add(item);
return item;
}
public void Remove(int id)
{
   albums.RemoveAll(p =>p.Id == id);
}
public bool Update(Album item)
{
if (item == null)
{
   throw new ArgumentNullException("item");
 }
```

Adding a Repository 8-8

```
int index = albums.FindIndex(p =>p.Id == item.Id);
if (index == -1)
{
    return false;
}
     albums.RemoveAt(index);
     albums.Add(item);
     return true;
     }
     }
}
```

- In this code, the `AlbumRepository` class implements the `IAlbumRepository` interface that it created.
- For each of the methods declared in the `IAlbumRepository` interface, the `AlbumRepository` class provides implementation to retrieve, add, and delete albums that the `Album` model represents.

Adding an ASP.NET Web API Controller 1-9

- After creating the model named, `Album` and the repository implementation that acts as a data source for `Album` objects, add an ASP.NET Web API controller to the application.

- The ASP.NET Web API controller is a class that handles HTTP requests from the client.

- This class extends the `ApiController` class and provides methods that are invoked for various types of requests, such as `GET`, `POST`, `PUT`, and `DELETE`.

Adding an ASP.NET Web API Controller 2-9

- Following steps help to create an ASP.NET Web API controller in Visual Studio :

Step 1

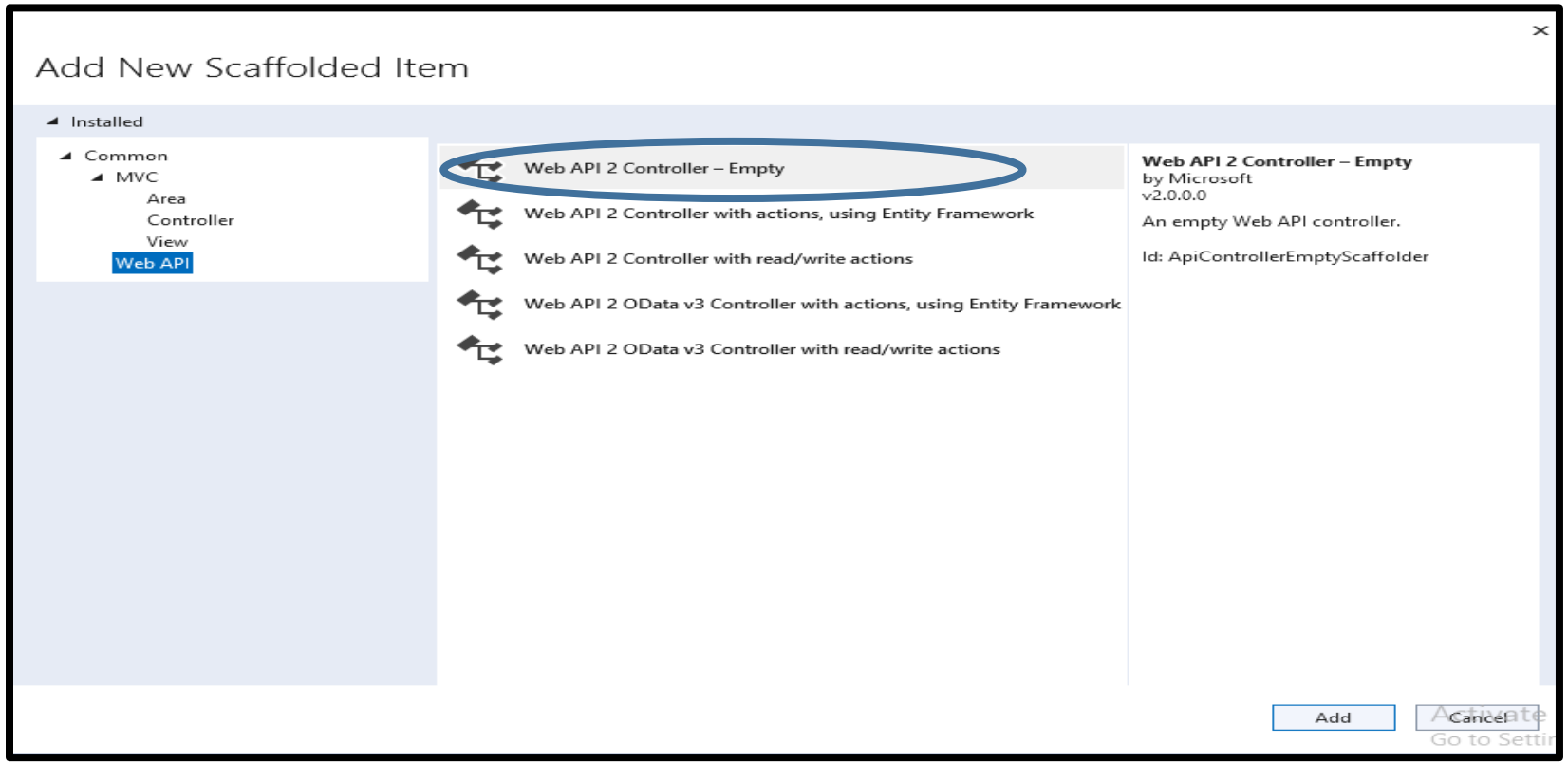
- Right-click the **Controllers** folder in the Solution Explorer window and select **Add** → **Controller** from the context menu that appears. The **Add Scaffold** dialog box is displayed.

Step 2

- Select the **Web API 2 Controller** – **Empty** template in the **Add Scaffold** dialog box.

Adding an ASP.NET Web API Controller 3-9

- Following figure shows the **Add Scaffold** dialog box:



Adding an ASP.NET Web API Controller 4-9

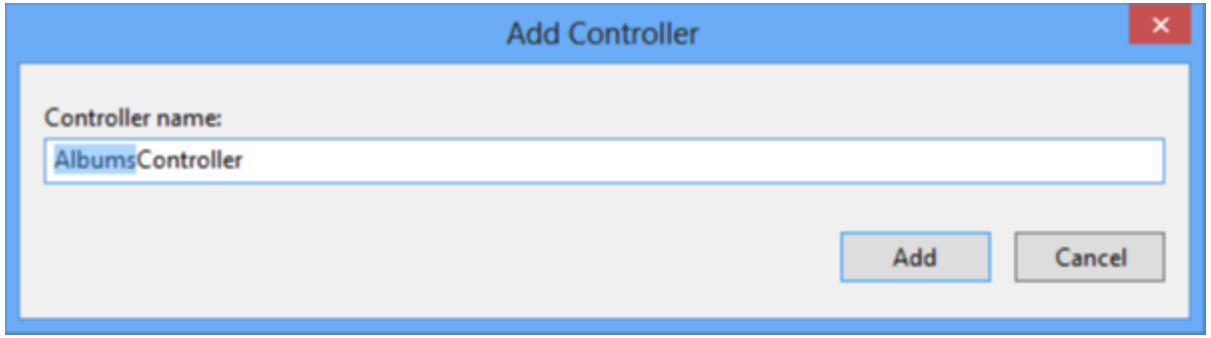
Step 3

- Click **Add**. The **Add Controller** dialog box is displayed.

Step 4

- Type **AlbumsController** in the **Controller** name field.

- Following figure shows the **Add Controller** dialog box:



Adding an ASP.NET Web API Controller 5-9

Step 5

- Click **Add**. The Code Editor displays the newly created `AlbumsController` controller class.

Step 6

- In the `AlbumsController` controller class, add the HTTP methods to retrieve, add, update, and delete albums that the `AlbumRepository` object contains.

Adding an ASP.NET Web API Controller 6-9

- Following code shows the `AlbumsController` class:

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Net;
using System.Net.Http;
using System.Web.Http;
using WebAPIDemo.Models;

namespace WebAPIDemo.Controllers
{
  public class AlbumsController : ApiController
  {
    static readonly IAlbumRepository albumRepository = new AlbumRepository();

    public IEnumerable<Album> Get()
    {
```

Adding an ASP.NET Web API Controller 7-9

```
        return albumRepository.GetAll();
    }

    public Album Get(int id)
    {
        Album album = albumRepository.Get(id);
        if (album == null)
        {
        throw new HttpResponseException(HttpStatusCode.NotFound);
        }
        return album;
    }
    public IEnumerable<Album> GetAlbumByGenre(string genre)
    {
       return albumRepository.GetAll().Where(
        p =>string.Equals(p.Genre,genre,
            StringComparison.OrdinalIgnoreCase ));
    }
```

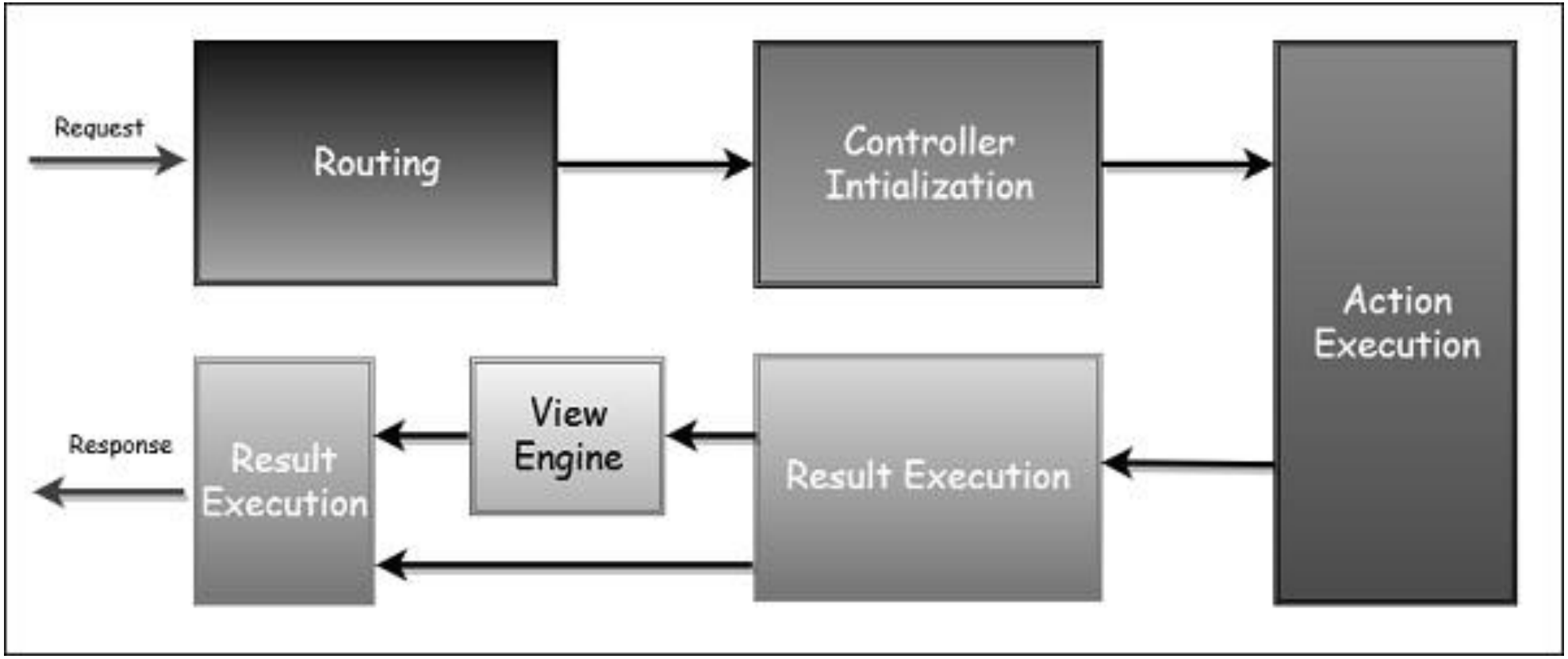
Adding an ASP.NET Web API Controller 8-9

```
    public string Post(Album album)
    {
          album = albumRepository.Add(album);
          return "Album added successfully";
    }
    public void Put(int id, Album album)
    {
         album.Id = id;
         albumRepository.Update(album);
    }
    public void Delete(int id)
    {
        Album album = albumRepository.Get(id);
        albumRepository.Remove(id);
    }
  }
}
```

Adding an ASP.NET Web API Controller 9-9

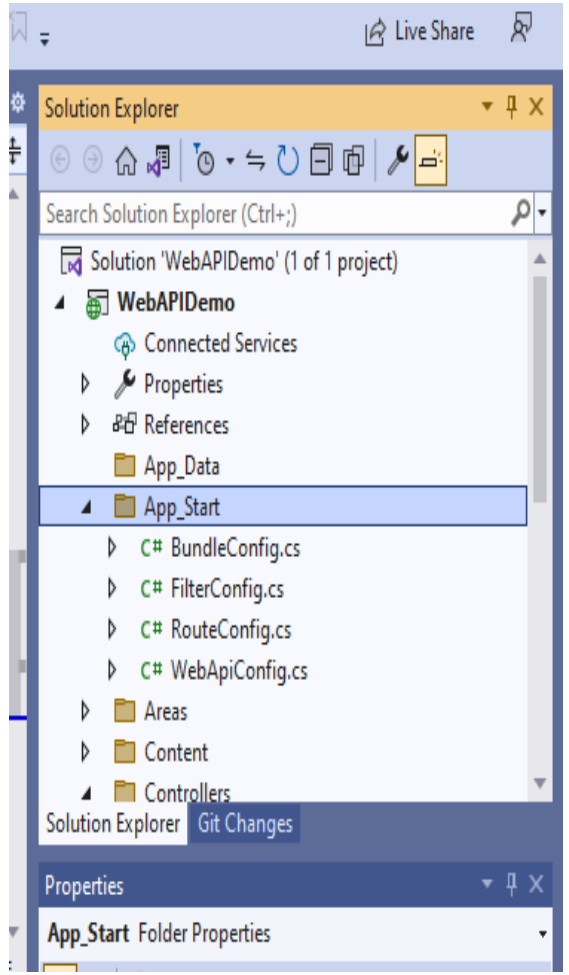
- In this code:
  - The `AlbumsController` class extends the `ApiController` class.
  - The `Get()` method accesses the album repository to return all albums as an `IEnumerable <Album>` object. The `Get(int id)` method accesses the album repository to return an album with the specified Id as an `Album` object.
  - The `GetAlbumByGenre(string genre)` method returns all albums of the specified genre as an `IEnumerable <Album>` object.
  - The `Post(Album album)` method adds the `Album` object passed as parameter to the album repository. The `Put(int id, Album album)` method updates an album in the album repository based on the specified id.
  - The `Delete(int id)` method deletes an album from the album repository based on the specified id.

Steps that the components of the ASP.NET MVC Framework performs while handling an incoming request:



Defining Routes 1-3

- After creating the ASP.NET Web API controller, register it with the ASP.NET routing Framework.
- When the Web API application receives a request, the routing framework tries to match the Uniform Resource Identifier (URI) against one of the route templates defined in the **`WebApiConfig.cs`** file.
- If no route matches, the client receives a 404 error.
- When an ASP.NET Web API application is created in Visual Studio by default, the IDE configures the route of the application in the **`WebApiConfig.cs`** file under the **`App_Start`** folder.



Defining Routes 2-3

- config.Routes.MapHttpRoute is a method in ASP.NET Web API used to configure the routing for HTTP requests to Web API controllers.

```
config.Routes.MapHttpRoute(
name: "DefaultApi",
routeTemplate: "api/{controller}/{id}",
defaults: new { id = RouteParameter.Optional }
    );
```

  - This code shows the default route configuration for an ASP.NET Web API application. This route configuration contains a route template specified by the `routeTemplate` attribute defines the URL pattern to match: `"api/{controller}/{id}"`

- In the preceding route pattern:
  - `api`: is a literal path segment
  - `{controller}`: is a placeholder for the name of the controller to access
  - `{id}` : is an optional placeholder that the controller method accepts as parameter

Defining Routes 3-3

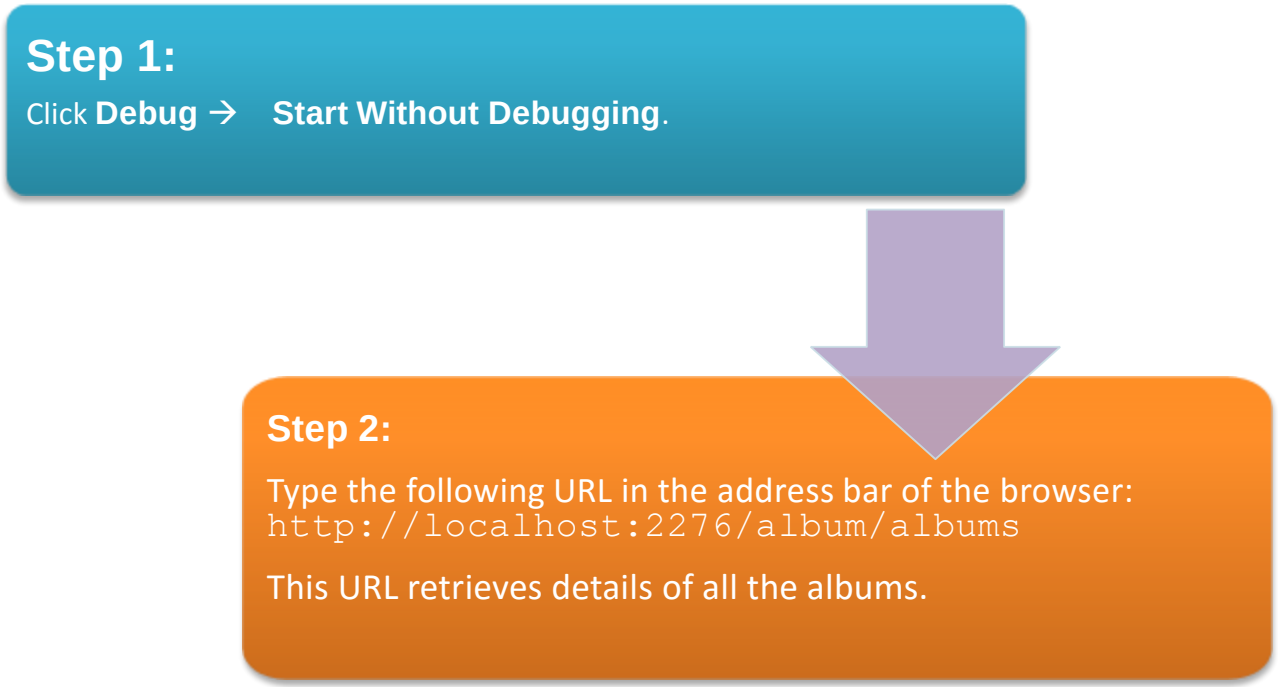
- To configure a new route in the `WebApiConfig.cs` file, refer the following code:

```
config.Routes.MapHttpRoute(
name: "AlbumWebApiRoute",
routeTemplate: "album/{controller}/{id}",
defaults: new { id = RouteParameter.Optional }
    );
```

- In this code, a route named, `AlbumWebApiRoute` is created with the route pattern `album/{controller}/{id}`.

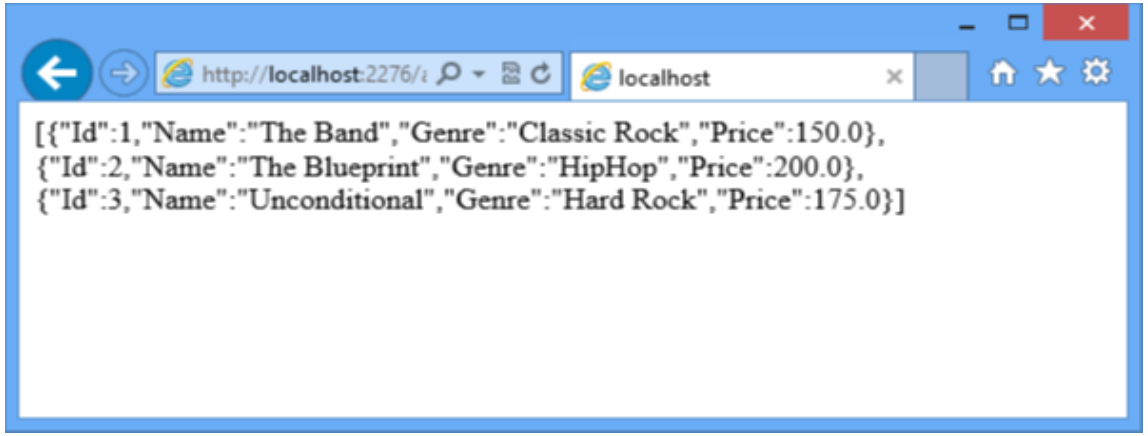
Assessing the Application 1-2

- After creating the controller class and configuring the routing of the ASP.NET Web API application, access it from a browser using the following steps:



Assessing the Application 2-2

- The browser displays the album details as shown in the following figure:



- To access a specific album, based on the Id, type the following URL in the address bar of the browser:

```
http://localhost:2276/album/albums/1
```

Summary

- ASP.NET Web API is a .NET Framework technology to create Web services for different types of clients.
- ASP.NET Web API is an implementation of RESTful service that removes the complexities of creating Web services by relying purely on HTTP.
- HTTP is the standard protocol for communication over the Web.
- REST is a service architecture where each request URL is unique and points to a specific resource.
- Media type is a standard to identify the type of data being exchanged over the Internet between the browser and the server.
- In an ASP.NET Web API service, the routing framework is responsible to match request URI against one of the route templates defined in the WebApiConfig.cs file.