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How to use the options pattern in ASP.NET Core

Take advantage of the options pattern to load configuration data directly into your classes at runtime for simple and flexible configuration data management

When working in ASP.NET Core you will often specify your application's settings, store them in some file, and then retrieve these settings when the application needs them. Typically, you would register your dependencies in the `ConfigureServices` method of the `Startup` class. You can specify your application's settings in the `appsettings.json` or some other `.json` file and then take advantage of dependency injection through `IOptions<T>` to read these settings in your application.

The options patterns provide an elegant way to add strongly typed settings to your ASP.NET Core application. The options pattern, which is an extension on top of the `IServiceCollection` interface, takes advantage of classes to represent a group of related settings. This article talks about the options pattern, why it is useful, and how it can be used for working with configuration data in ASP.NET Core.

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To work with the code examples provided in this article, you should have Visual Studio 2019 installed in your system. If you don't already have a copy, you can download Visual Studio 2019 [here](#).

Create an ASP.NET Core API project

First off, let's create an ASP.NET Core project in Visual Studio. Assuming Visual Studio 2019 is installed in your system, follow the steps outlined below to create a new ASP.NET Core API project in Visual Studio.

1. Launch the Visual Studio IDE.
2. Click on "Create new project."
3. In the "Create new project" window, select "ASP.NET Core Web Application" from the list of templates displayed.
4. Click Next.
5. In the "Configure your new project" window shown next, specify the name and location for the new project.
6. Click Create.
7. In the "Create New ASP.NET Core Web Application" window, select .NET Core as the runtime and ASP.NET Core 3.0 (or later) from the drop-down list at the top. I'll be using ASP.NET Core 3.1 here.
8. Select "API" as the project template to create a new ASP.NET Core API application.
9. Ensure that the check boxes "Enable Docker Support" and "Configure for HTTPS" are unchecked as we won't be using those features here.
10. Ensure that Authentication is set as "No Authentication" as we won't be using authentication either.
11. Click Create.

This will create a new ASP.NET Core API project in Visual Studio. Select the Controllers solution folder in the Solution Explorer window and click "Add -> Controller..." to create a new controller named DefaultController. We'll use this project in the subsequent sections of this article.

Implement the options pattern in ASP.NET Core

To use the options pattern in ASP.NET Core, you need the `Microsoft.Extensions.Options.ConfigurationExtensions` package. Incidentally, the ASP.NET Core applications implicitly references the

Microsoft.Extensions.Options.ConfigurationExtensions package by default.

When using the options pattern, you would typically want to use classes to represent a group of related settings. In isolating the configuration settings into separate classes, your application adheres to the following principles:

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- Separation of concerns: The settings used in different modules of the application are decoupled from one another.
- Interface segregation principle: The classes that represent these settings depend only on the configuration settings that they would use.

Now write the following settings in the appsettings.json file.

```
"DatabaseSettings": {  
  "Server": "localhost",  
  "Provider": "SQL Server",  
  "Database": "DemoDb",  
  "Port": 23,  
  "UserName": "sa",  
  "Password": "Joydip123"  
}
```

Note that your configuration class should have public get and set properties. We'll take advantage of the following class to read these settings shortly.

```
public class DatabaseSettings  
{  
    public string Server { get; set; }  
    public string Provider { get; set; }  
    public string Database { get; set; }  
    public int Port { get; set; }  
    public string UserName { get; set; }  
    public string Password { get; set; }  
}
```

You can now use the `Configure` extension method of `IServiceCollection` to bind your settings class to your configuration as shown in the code snippet given below.

```
public void ConfigureServices(IServiceCollection services)
{
    services.AddControllers();
    services.Configure<DatabaseSettings>
        (options => Configuration.GetSection("DatabaseSettings").Bind(options));
}
```

Read configuration data in the controller in ASP.NET Core

We'll now take advantage of the `DefaultController` we created earlier to demonstrate how we can read configuration data in the controller. The `IOptions<T>` interface exposes a `Value` property that can be used to retrieve the instance of the settings class.

The following code snippet shows how you can use the `DatabaseSettings` class in your controller named `DefaultController`. Note how dependency injection (constructor injection in this example) has been used here.

```
public class DefaultController : ControllerBase
{
    private DatabaseSettings _settings;
    public DefaultController(IOptions<DatabaseSettings> settings)
    {
        _settings = settings.Value;
    }
    //Action methods
}
```

Enforce rules for configurations in ASP.NET Core

You can also enforce certain rules as shown in the code snippet below. Note how an instance of the helper class for SQL Server or MySQL is being added as a singleton here.

```
services.Configure<DatabaseSettings>(options =>
{
    if (options.Provider.ToLower().Trim().Equals("sqlserver"))
    {
        services.AddSingleton(new SqlDbHelper());
    }
    else if(options.Provider.ToLower().Trim().Equals("mysql"))
    {
        services.AddSingleton(new MySqlDbHelper());
    }
});
```

Support for strongly typed configuration is a great feature in ASP.NET Core that enables you to apply the separation of concerns and interface segregation principles. In a future post here on the options pattern, I'll talk about configuration validation and reloadable configuration with a special focus on the `IOptionsMonitor<TOptions>` interface. Until then, you can read more about the options pattern in Microsoft's online documentation [here](#).

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Joydip Kanjilal is a Microsoft MVP in ASP.Net, as well as a speaker and author of several books and articles. He has more than 20 years of experience in IT including more than 16 years in Microsoft .Net and related technologies.

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