6. Dependency Injection

DI in ASP.NET Core

- The ASP.NET Core framework has been designed from the ground up to be modular and to adhere to good software engineering practices, such as the SOLID principles.
- On that basis, ASP.NET Core has DI baked into the heart of the framework.

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An Example without DI (一)

- Suppose that a user has registered on your web app, and you want to send them an email.
- EmailSender would need to:
  - Create an email message
  - Configure the settings of the email server
  - Send the email to the email server
- Doing all that in one class would go against the single-responsibility principle.

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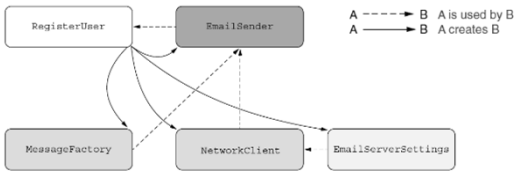
An Example without DI (二)

- Each class has several dependencies, so the "root" caller—the RegisterUser handler—needs to know how to create every class it depends on, which is called dependency graph.



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An Example without DI (三)

- This code is turning into something gnarly.

```
string RegisterUser(string username)
{
    var emailSender = new EmailSender(
        new MessageFactory(),
        new NetworkClient(
            new EmailServerSettings
            (
                Host: "smtp.server.com",
                Port: 25
            ))
    );
    emailSender.SendEmail(username);
    return $"Email sent to {username}!";
}
```

To create EmailSender, you must create all its dependencies.

You need a new MessageFactory.

The NetworkClient also has dependencies.

You're already two layers deep, but there could feasibly be more.

Finally, you can send the email.

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An Example without DI (四)

- This code has several problems:
  - Not obeying the SRP
  - Considerable ceremony
  - Tied to the implementation
  - Hard to reuse instance
- RegisterUser has an **implicit** dependency on the EmailSender class, as it creates the object manually itself. The only way to know that RegisterUser uses EmailSender is to look at its source code.

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Understanding DI (一)

- Generally speaking, any dependencies in your code should be **explicit**, not implicit.
- DI aims to solve the problem of building a **dependency graph** by inverting the chain of dependencies.
- The **DI container** is responsible for creating instances of services.
- The DI container knows how to construct an instance of a service by creating all its dependencies and passing them to the constructor.

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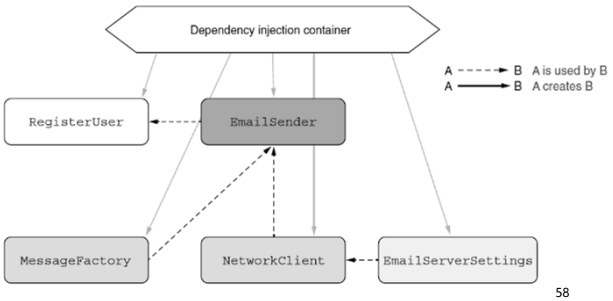
Understanding DI (二)



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Understanding DI (三)

- The code shows how the RegisterUser handler would look if DI is used to create EmailSender instead of creating it manually.

```
string RegisterUser(string username, EmailSender emailSender)
{
    emailSender.SendEmail(username);
    return $"Email sent to {username}!";
}
```

The handler is easy to read and understand again.

Instead of creating the dependencies implicitly, injects them directly

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Using DI in ASP.NET Core (一)

- ASP.NET Core uses DI to configure both its internal components, such as the Kestrel web server, and extra features, such as MVC framework.
- To use these components at runtime, the DI container needs to know about all the classes it will need.

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Using DI in ASP.NET Core (二)

- Register these services with the Services property on the WebApplicationBuilder instance in Program.cs.

```
var builder = WebApplication.CreateBuilder(args);
builder.Services.AddSingleton<Dependency1>();
builder.Services.AddSingleton<Dependency2>();
builder.Services.AddSingleton<Dependency3>();
builder.Services.AddDemoFeature();
```

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Using DI in ASP.NET Core (三)

- In ASP.NET Core, there are three possible service lifetimes to choose from:

Lifetime	Description	Code sample
Transient	The container creates a new object every time you ask for one.	`services.AddTransient<ISomeService, SomeService>();`
Scoped	The container creates an object per HTTP request and passes that object around to all other objects that want to use it.	`services.AddScoped<ISomeService, SomeService>();`
Singleton	The container creates a single instance of that dependency and always passes that unique object around.	`services.AddSingleton<ISomeService, SomeService>();`

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Project: Register the services

```
//注册MVC服务
builder.services.AddControllersWithViews();
//仓库接口依赖注入，仅实例化一个对象
builder.services.AddSingleton<IEmployeeRepository,
EmployeeRepository>();

app.MapDefaultControllerRoute();
```

Program.cs

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7. URL Routing

Convention Routing（一）

- Controllers rely on convention routing instead of the Route attribute.
- The convention in this term refers to the use of the controller class name and the action method name used to configure the routing system.

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Convention Routing（二）

- MapDefaultControllerRoute registers the MVC Framework as a source of endpoints using a **default convention** for mapping requests to classes and methods.

```
app.MapDefaultControllerRoute();
```

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Convention Routing（三）

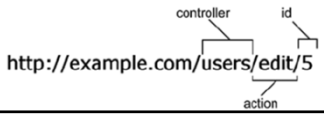
- MapControllerRoute method

```
app.MapControllerRoute(
    name: "default",
    pattern: "{controller=EmployeeManager}/{action=List}/{id?}");
```

Route name

URL with params

Param defaults



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Convention Routing（四）

Exercise

- What's the problem with the code?

```
endpoints.MapControllerRoute(
     name: "default",
     pattern: "{controller}/{action}");

endpoints.MapControllerRoute(
     name: " admin ",
     pattern: "Admin/{action}");
```

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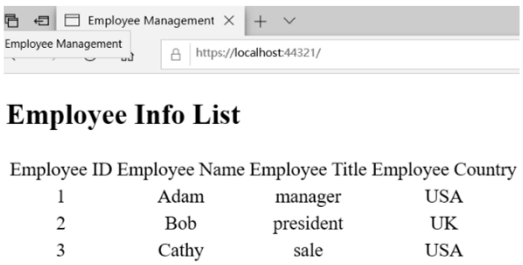
Project: Run the Application



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8. Logging Service

Understanding Logging (一)

- Logging is the process of recording events or activities in an app.
  - Debug errors
  - Trace operations
  - Analyze usage
- Logging is a cross-cutting concern, meaning it applies to every piece of your application.

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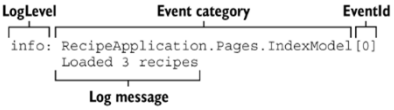
Understanding Logging (二)

- Logging often involves writing a record to a console, a file, the Windows Event Log, or some other system.
- A log is made up of log entries.
- Each log entry is considered as an event that happened during the program's execution.



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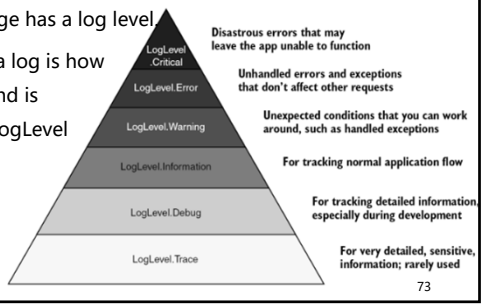
Understanding Logging (三)

- Every log message has a log level.
- The log level of a log is how important it is and is defined by the LogLevel enum.



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The ASP.NET Core Logging Framework (一)

- The ASP.NET Core logging framework consists of several abstractions:
  - Ilogger - It has a Log() method, which is used to write a log message.
  - ILoggerProvider - Create a custom instance of an ILogger, depending on the provider.
  - ILoggerFactory - Glue between the ILoggerProvider instances and the Ilogger.

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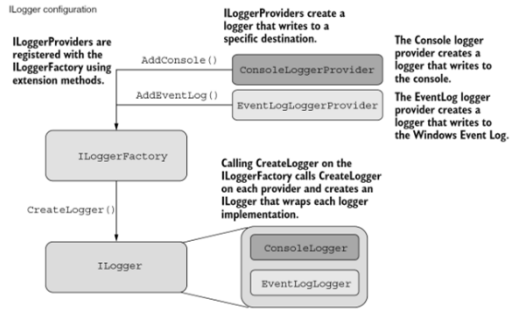
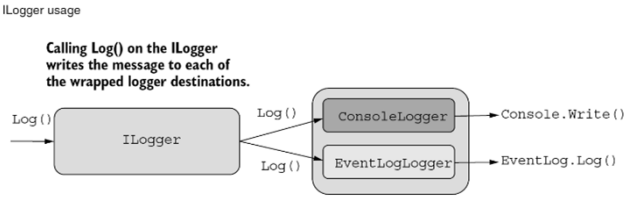
The ASP.NET Core Logging Framework (二)



The ASP.NET Core Logging Framework (三)



Adding a Console Log Provider in Program.cs

```
WebApplicationBuilder builder = WebApplication.CreateBuilder(args);
builder.Logging.AddConsole()

WebApplication app = builder.Build();

app.MapGet("/", () => "Hello World!");

app.Run();
```

Adds a new provider using the Logging property on WebApplicationBuilder

Adding Log Messages to Your Application

```
public class IndexModel : PageModel
{
    private readonly RecipeService _service;
    private readonly ILogger<IndexModel> _log;

    public ICollection<RecipeSummaryViewModel> Recipes { get; set; }

    public IndexModel(
        RecipeService service,
        ILogger<IndexModel> log)
    {
        _service = service;
        _log = log;
    }

    public void OnGet()
    {
        Recipes = _service.GetRecipes();
        _log.LogInformation(
            "Loaded {RecipeCount} recipes", Recipes.Count);
    }
}
```

Injects the generic ILogger<T> using DI, which implements ILogger

Writes an Information-level log. The RecipeCount variable is substituted in the message.

Changing Log Verbosity with Filtering (一)

- ASP.NET Core includes the ability to filter out log messages before they're written, based on a combination of three things:
  - The log level of the message
  - The category of the logger (who created the log)
  - The logger provider (where the log will be written)

Changing Log Verbosity with Filtering (二)

- The Logging:LogLevel section of the appsettings.json file is used to set the minimum level for logging messages.
- Log messages that are below the minimum level are discarded.

```
{
  "Logging": {
    "LogLevel": {
      "Default": "Debug",
      "System": "Warning",
      "Microsoft": "Warning"
    },
    "File": {
      "LogLevel": {
        "Default": "Information"
      }
    },
    "Console": {
      "LogLevel": {
        "Default": "Debug",
        "Microsoft": "Warning"
      }
    }
  }
}
```

Rules to apply if there are no specific rules for a provider

Rules to apply to the File provider

Rules to apply to the Console provider