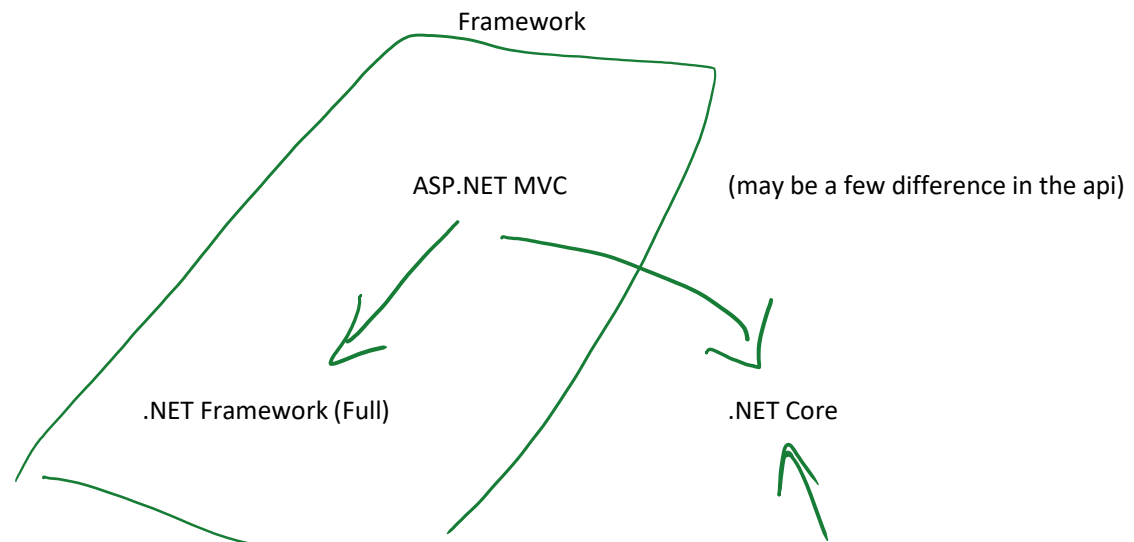


# Agenda

Monday, May 11, 2020 9:35 AM

**ASP.NET MVC <--- Application Framework <---- Helps you develop the application**

**.NET Core Application <----- Runtime Framework/Platform <----- helps you execute the application**



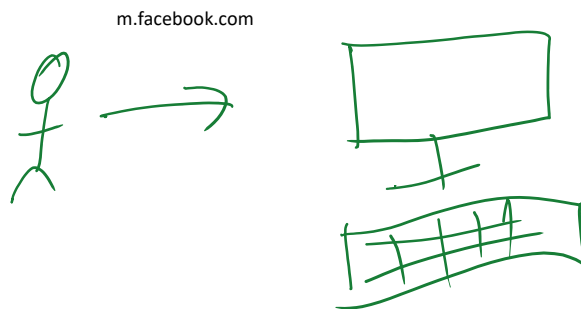
# Http Protocol

Monday, May 11, 2020 10:03 AM

<http://m.facebook.com> <---- Open Mobile Site

<http://www.ircctc.co.in/mobile>

GET m.facebook.com/\r\n  
User-Agent: chrome, windows10\r\n



It is a contradiction between the URL and the User-Agent

Url --> give me mobile site  
User-Agent --> give me desktop site



GET /some/url  
**connection: keep-alive**

- Request to keep the connection alive
- Don't close the Tcp socket (Please)
- Browsers almost always send this header to the client
- Server can (and very often does) ignore this request

Server Response

<https://books.org/list?cat=thriller>

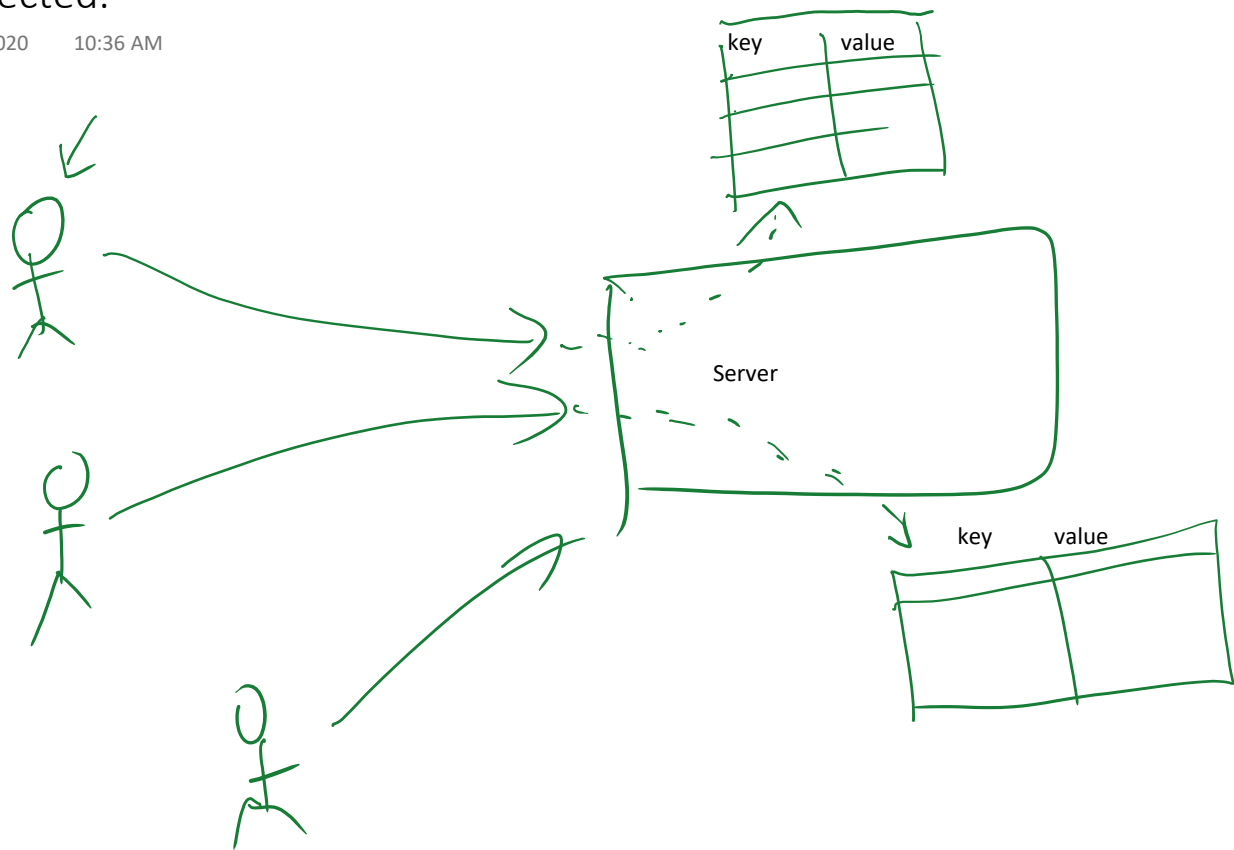
<https://amazon.in/proucts?q=mobile-cover&model=samung-note-8>

200 OK  
Content-type:text/html  
**date-modified:2020/04/13**

Clients second request

How will server connect a user to its session when socket is disconnected.

Monday, May 11, 2020 10:36 AM



# Cache Redirect

Monday, May 11, 2020 11:28 AM

## Server Response

200 OK  
Content-type:text/html  
**date-modified:2020/04/13**

## Client Next Response

GET /resource  
**if-modified-since:2020/01/30**

//content changed after clients previous visit

200 OK  
Content-type:text/html  
**date-modified:2020/04/13**

**Gets new Data**

## Client Next Response

GET /resource  
**if-modified-since:2020/05/04**

//content not modified after the last visit

**304 Not Modified**  
\r\n

Cache Redirect

Can use the existing

# MVC

Monday, May 11, 2020

12:19 PM

Presentation

Business

Data

View

~~Controller~~

Model

Model



# Standard Network Port

Tuesday, May 12, 2020 9:26 AM

As an admin I can run any server on any available (free) port.

One Machine ----> One Port ----> One App (One socket)

Standard Practice

First 1K port is reserved for standard protocol

- 20,21 ----> FTP
- 25 ----> SMTP
- 80 ----> HTTP
- 110 ----> POP
- 443 ----> HTTPS

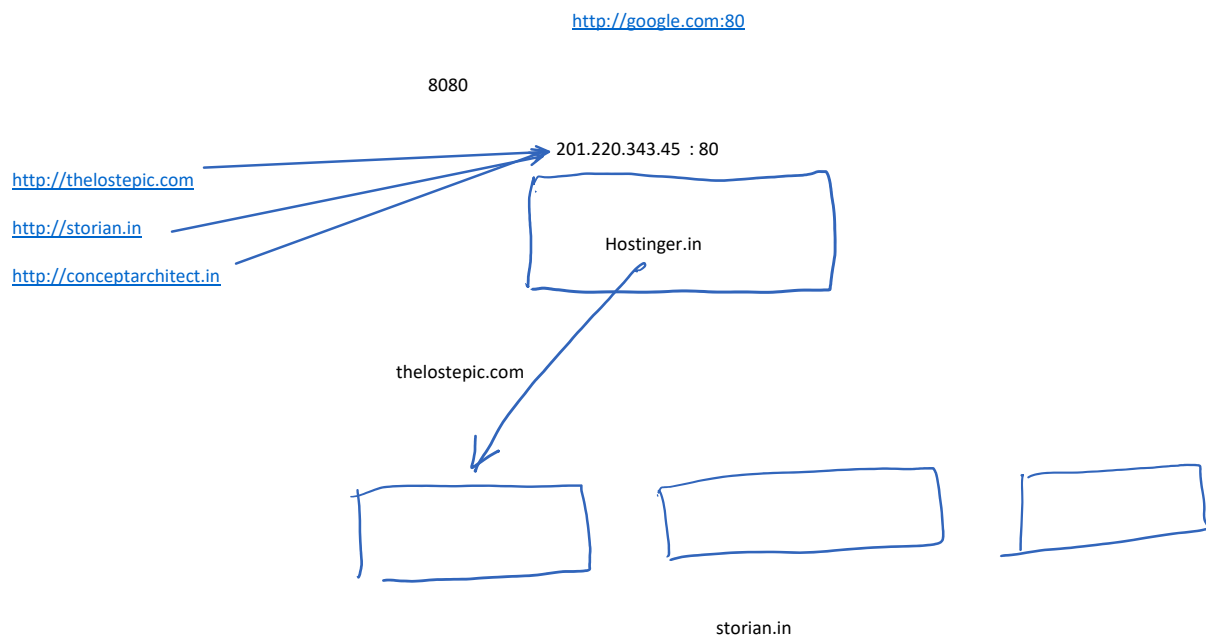
Q. What if I run HTTP Server on a Non Standard Port

A. The URL Will Change

a. <http://books.org:3393/books>

- now we say the server will be available on port 3393.

- You can imagine that default url is a shortform for
  - <http://books.org:80/books>
  - <http://books.org:445/books>



# MVC URL

Tuesday, May 12, 2020 10:00 AM

## Traditional View

<http://localhost:57586/> <----- index.html/default.html/default.aspx/default.php ---> from root directory

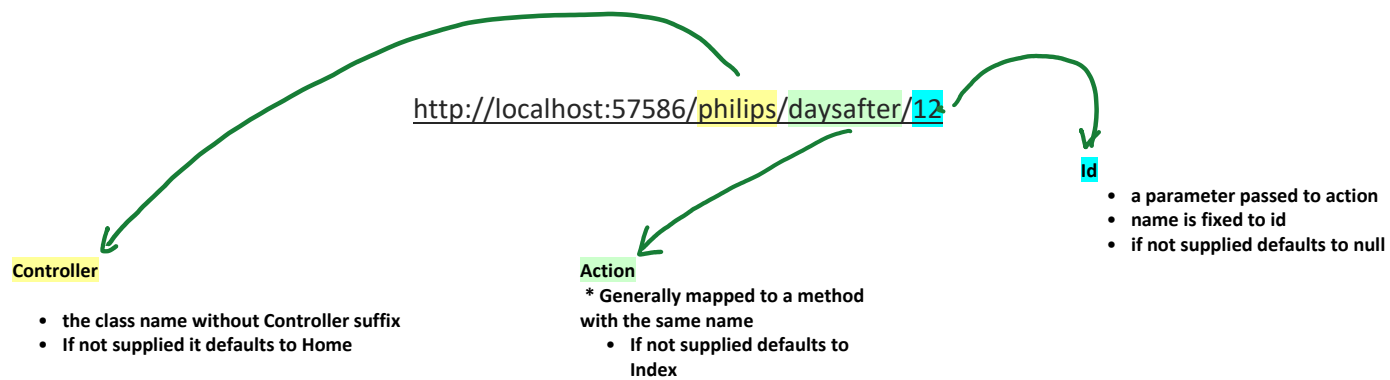
<http://localhost:57586/Home/Contact> <----- index.html/default.html/default.aspx from /Home/Contact directory

<http://localhost:57586/Home/About>

<http://localhost:57586/books.html> <----- request for books.html file in root directory

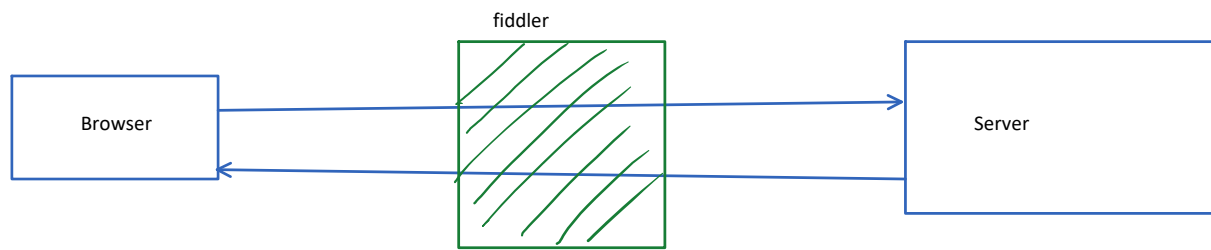
<http://localhost:57586/Home/About/authors.aspx> <----- execute authors.aspx page from /Home/About folder

## MVC URL has by default 3 parts



# How Fiddler Works

Tuesday, May 12, 2020 10:41 AM





# Controller--->Action--->ActionResult

Tuesday, May 12, 2020 11:38 AM

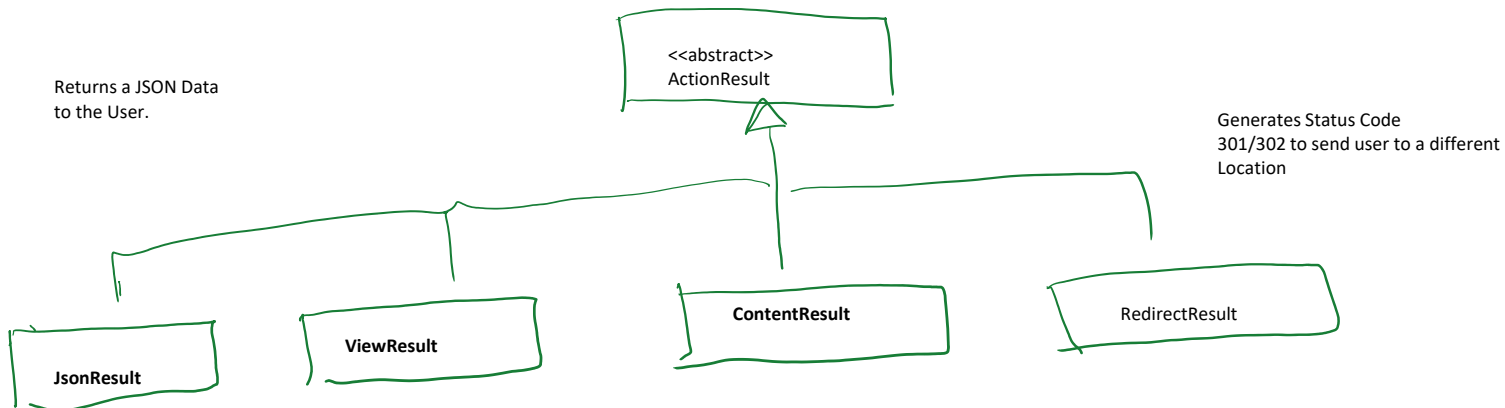
1. An Url is a request for a **Controller** to perform some **Action**
2. Once an Action is performed it returns an **ActionResult**
3. ActionResult is returned to the User As a **View**

**Controller** ----> is an object

**Action** ----> is what controller do

**ActionResult** ----> return of the Action

**View** ----> what user sees (ActionResult)



## ViewResult

ViewResult uses a ViewEngine to generate a dynamic Html View using Model Data and a ViewTemplate

## ContentResult

One of the simplest ActionResult  
It returns a given String content to the user without any processing.

If your **Action** is not returning an **ActionResult**  
The current object is automatically converted to **ContentResult** by the controller

A code like

```
public Person Contact()
{
    var p=new Person();
    return p;
}
```

Is internally converted to (psudocode)

```
public ContentResult Contact(){
    var p=new Person();
    return new ContentResult()
    {
        Content=p.ToString()
    };
}
```

This happens with the base Controller

# Razor view engine processing

Tuesday, May 12, 2020 12:26 PM

Razor is one of the simplest view engine to combine view template (HTML) with C# Code (**CS+HTML = CSHTML**)

```
<h2>Welcome To Philips Server</h2>
@{
    //this is a c# code block. you can write any c# here
    var date = DateTime.Now;
}
<p><strong>Date is </strong>@date.ToLongDateString()</p>
<p><strong>Time is </strong>@date.ToLongTimeString()</p>
```

## Razor Block Code

```
@{
    //razor block
}
```

You can write any processing statement, assignments etc in this block. This block doesn't have direct output on the screen unless you write Response.Write()

## Razor Display Expression

@something

It is a shortcut for

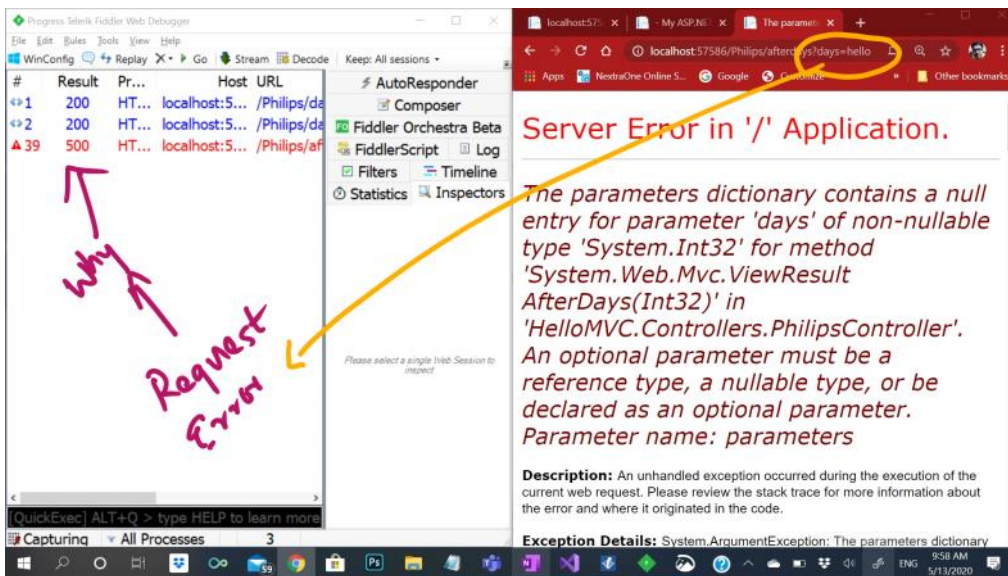
```
@{ Response.Write(something); }
```

Notice there is no semicolon after simple razor expression what ever you type automatically used as argument to Response.Write()

Also Note @is automatically closed when it finds html code

# HTTP Errors!

Wednesday, May 13, 2020 9:56 AM

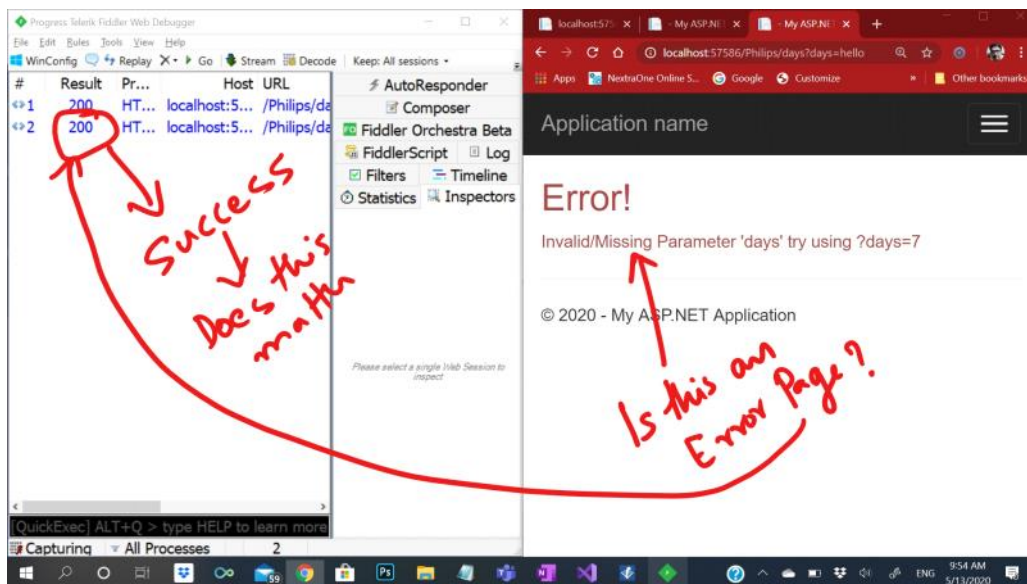


Is this a client request error or a Server Side error as notified.

Ideally it should be request error (400)

But it is server error, because Server didn't tell user they made a mistake

Server is uselessly taking on the guilt!



If This is an error page,

Why is the status code 200?

What should be the status code here?

It should be **400 Bad Request**

Does it matter 200/400? After all end user is going to see Error page and not the actual status code?

YES.  
Humans are not the only one who see a webpage

Automated system like search engine crawlers or automated testing frameworks also see these outputs

- Do you want search engine crawlers to index even error page?
- Do you want automated systems to check color of message to decide if it is an error page?

# URL Formats

Wednesday, May 13, 2020 10:41 AM

Which is a better URL to get a list of all Books By Jeffery Archer?

Approach#1 -- Traditional with id

<http://books.org/books.aspx?author=2915>

Approach#2 -- Traditional with name

<http://books.org/books.aspx?author=jeffrey-archer>

Approach#3 -- MVC URL

<http://books.org/books/by/jeffrey-archer>

Problem Approach#1

- need to remember an id
- what will be the list of books by john grisham called?

Problem Approach#2

- long and complicated url
- It looks too techy
  - Query Strings are ugly
- **Technology Id (.aspx)**
  - **Why should I include technology id in an URL?**
  - **What Jeffrey Archer book list has got to do with .net framework?**
- **Why Url shouldn't include technology**
  - **because we may switch our technology tomorrow**
  - **Then all urls we created today will be useless**
  - **All bookmarks will be dead**

## W3C Recommendation for a URL

A URL should be

- Short
- Simple (Easy to Remember)
- Permanent (Removed Technology ID)
- identification of a resource (business)

URL shouldn't include

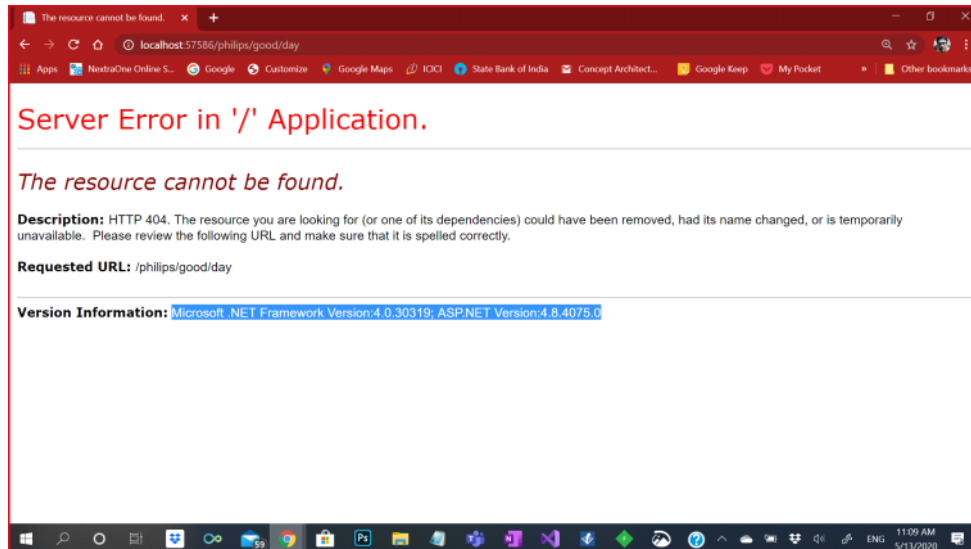
- Technology id such as
  - aspx/php/jsp
  - data format json/xml
  - device id eg m.facebook.com or irctc.in/mobile

<http://yt.be/5x9q8z>

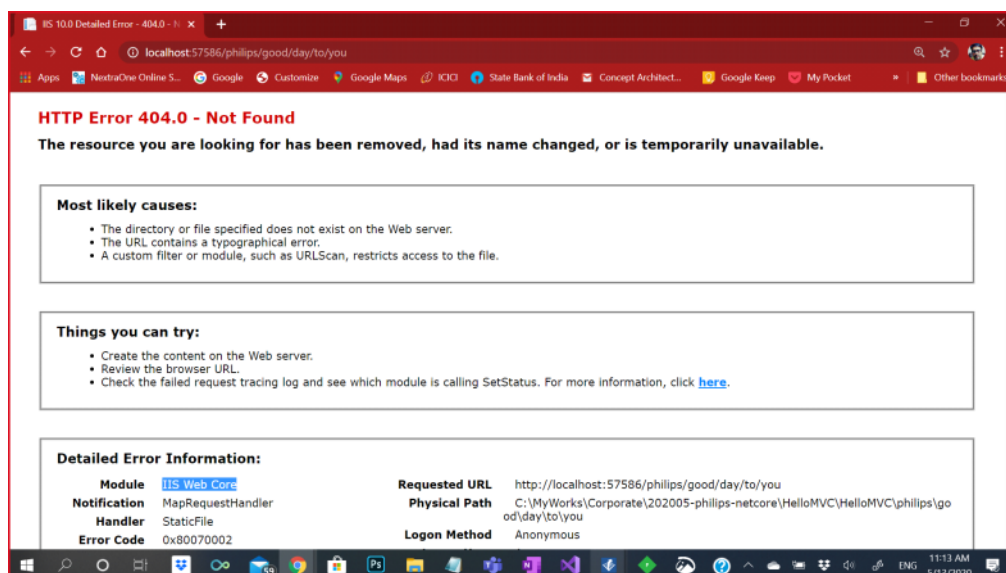
- SHORT BUT NOT SIMPLE!

# MVC Lifecycle Error Handler

Wednesday, May 13, 2020 11:09 AM



- A 3 part URL is recognized as an MVC URL
- Routing Module passes control to `MvcRouteHandler`
- `MvcRouteHandler` breaks the URL into
  - controller: philips
  - action: good
  - id: 'day'
- `MvcRouteHandler` passes control to `MvcRequestHandler`
- `MvcRequestHandler` successfully creates controller 'PhilipsController'
- Not the action 'good' is not available
- `MvcRequestHandler` returns 404



- A Route that is not configured by the `RoutingModule` falls back to IIS
- IIS tries to handle the url in traditional way by either
  - extension mapping
  - physical file search
- when both fails **IIS (not asp.net)** generates 404

# Assignment

Wednesday, May 13, 2020 11:54 AM

- Create a request for generating the Multiplication Table of a given number
- You choose your own URL structure
- The Url should take the number whose table is to be generated
- It should take an option second parameter for highest multiplier which should default to 10 if not passed
- Define success and error results properly

Use case 1 ---> Multiplication Table of 19 (Till its 10th Multiple)

Table of 19

Number	X	Result
19	1	19
19	2	38
19	3	
19	4	
19	5	
19	6	
19	7	
19	8	
19	9	
19	10	190

Use case 2 ----> Multiplication Table of 19 optional parameter sets highest multiple to 5

Table of 19

Number	X	Result
19	1	19
19	2	38
19	3	
19	4	
19	5	

# Conventional Programming

Thursday, May 14, 2020 9:20 AM

## Convention over configuration

- \* Prefer a conventional coding
  - \* reduces the need of configuration
- You are allowed to break/override convention if required
  - \* configuration can be one way to override convention

# Controller Execute

Thursday, May 14, 2020 9:41 AM

```
class Controller : Icontroller
{

    public void Execute( RequestContext context)
    {
        var httpContext= context.HttpContext;
        var routeData=context.RouteData;

        var actionName= routeData.Values["action"];

        var result= ActionInvoker.Invoke( actionName ); //this will search and execute an action method present in the controller

        ActionResult actionResult;

        if(result is ActionResult)
            actionResult=result;
        else
            result=new ContentResult(){ Content= result.ToString(); } //any normal return type is converted to ActionResult

        result.Exectue(); //generates the response!
    }

}
```



# Preventing Javascript Injection Attack!

Thursday, May 14, 2020 10:04 AM

## What if I type these content in a facebook wallpost

```
<h1>Hello There, I hav a news</h1>
```

```
<script>alert("Hi, I have a news");</script>
```

```
<script> for(i=0;i<100;i++) alert("Hello World"); </script>
```

If you are allowed to add any arbitrary html content to a web page user may

- Use Rich HTML/CSS format to express their idea, but it may break the site's theme
- Inject Scripts that may
  - deface the page at best
  - may inject malicious javascript to steal information and so on.
- Damage potential is endless

## Solution!

- Most modern ViewEngine doesn't allow you to inject any HTML code as data to a page
- Any data inject to a page will automatically be encoded by replacing "<" with "&lt;" and ">" with "&gt;"
- These codes will appear on the page but will not be treated as HTML
- Some application may simple refuse to inject the code and fail with a validation error.

# Books Web Site

Thursday, May 14, 2020 12:49 PM

## Overview

- A web app for book lovers where user can find
  1. A List of Books with informations such as
    - i. Title
    - ii. Author
    - iii. Price
    - iv. Description
    - v. Coverpage etc
    - vi. Reviews and Rating
    - vii. User can also leave their review about the book
  2. A List of Authors
    - i. Author Name
    - ii. Their Biography
    - iii. Photograps
    - iv. Books Written By Them
    - v. Reviews and Rating
  3. User
    - i. Login
    - ii. Logout
    - iii. Maintains A Book Shelf
    - iv. Maintain Contributions such as
      - 1) Reviews

## Assignment

1. Create The Model Classes
  - a. Book
  - b. Author
  - c. User
2. Plan the Routes (URL) to
  - a. what information you want to access
  - b. what operations you need to provide etc
3. Plan a outline of the pages that you need

# Book List

Friday, May 15, 2020

9:35 AM

Title	Author
My Experiments with Truth	Mahatma Gandhi
Mahatma Gandhi	Xyz
My Understanding Gita	Mahatma Gandhi

```
<table>
  <tr>
    <td>Title</td>
    <td>Author</td>
  </tr>

  <tr>
    <td>My Experiements with Truth</td>
    <td>Mahatma Gandhi</td>
  </tr>

  <tr>
    <td>Mahatma Gandhi</td>
    <td>Xyz</td>
  </tr>

  <tr>
    <td>My Understanding of Gita</td>
    <td>Mahatma Gandhi</td>
  </tr>
</table>
```

**What is difference Xml Vs HTML?**

**Xml is the information, HTML is presentation of information.**

**Xml retains the structure and meaning of data it holds**

- you can easily find out all the books authored by Mahatma Gandhi
  - Mahatama Gandhi doesn't appear in 'td' but in 'author'

**HTML looses the information in trying to a create a presentaion!**

**Xml vs Json**

- both are used in same scenario -- represent information
- JSON is more compact than XML
- JSON is easily understandable by Javascript
  - The most popular client for consuming services

**How to I select Book by Mahatma Gandhi and not on Mahatma Gandhi????**

**HTML is a picture of the information  
And sorrounded by HTML tags the information is often lost**

**Xml Representation**

```
<books>

  <book>
    <title>My Experiements with Truth</title>
    <author>Mahatma Gandhi</author>
  </book>

  <book>
    <title>Mahatma Gandhi</title>
    <author>Xyz</author>
  </book>

  <book>
    <title>My Understanding of Gita</title>
    <author>Mahatma Gandhi</author>
  </book>

</books>
```

**JSON Representation**

```
[
  "book":{
    "title": "My Experiements with Truth",
    "author": "Mahatma Gandhi"
  },
  "book":{
    "title": "Mahatma Gandhi",
    "author": "Xyz",
  }
  "book":{
    "title": "My Understanding of Gita",
    "author": "Mahatma Gandhi",
  }
]
```

# Cloud Vs Normal Internet Deployment

Friday, May 15, 2020 11:07 AM

- Internet deployment may take form of IAAS, PAAS, SAAS etc
- Each will have few layers

## Cloud


- defining feature is **Virtualization a.k.a Virtual Machine**
- Multiple Virtual Machines may be present on the same physical infrastructure
- Each Virtual machine will get promised computation power ( CPU/Storage/RAM/Bandwidth)
- **A virtual machine may be replicated on multiple infrastructure located in different geographical regions**
- Each change may be synchronized across various instances of the same server
- This allows
  - Scaling of requirement
    - We can launch a copy of virtual machine within a short span of time. A real hardware installation requires longer
    - We can launch such VMs nearest to my consumer base reducing the turnaround time.
    - Proper Load Balancing among various instances
  - Robust
    - Even if one VM or geographical location is compromised your system is still available via other instance
    - You are not completely out of business because of geographical conditions.

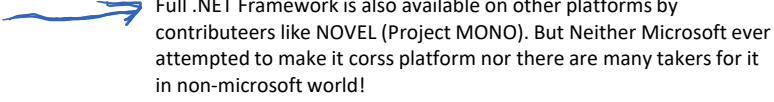
## Virtual Machine Requirement

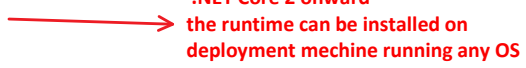
- Light weight software system
  - Easy to replicate
- Smaller virtual machines
- Design which can handle failures and crashes.

# .Net Core vs .NET Framework

Friday, May 15, 2020 11:23 AM

- .NET is
  - **Lightweight** (more like a subset) of full .NET Framework.
  - Doesn't support all features of .NET Framework like --
    - WinFrom
    - WebForms
    - WCF
    - WPF

**Introduced in .NET Core 3**
  - Make it universally available. unlike .NET Framework .NET core is easily deployed on
    - Linux
    - Mac
    - **High avialbility**

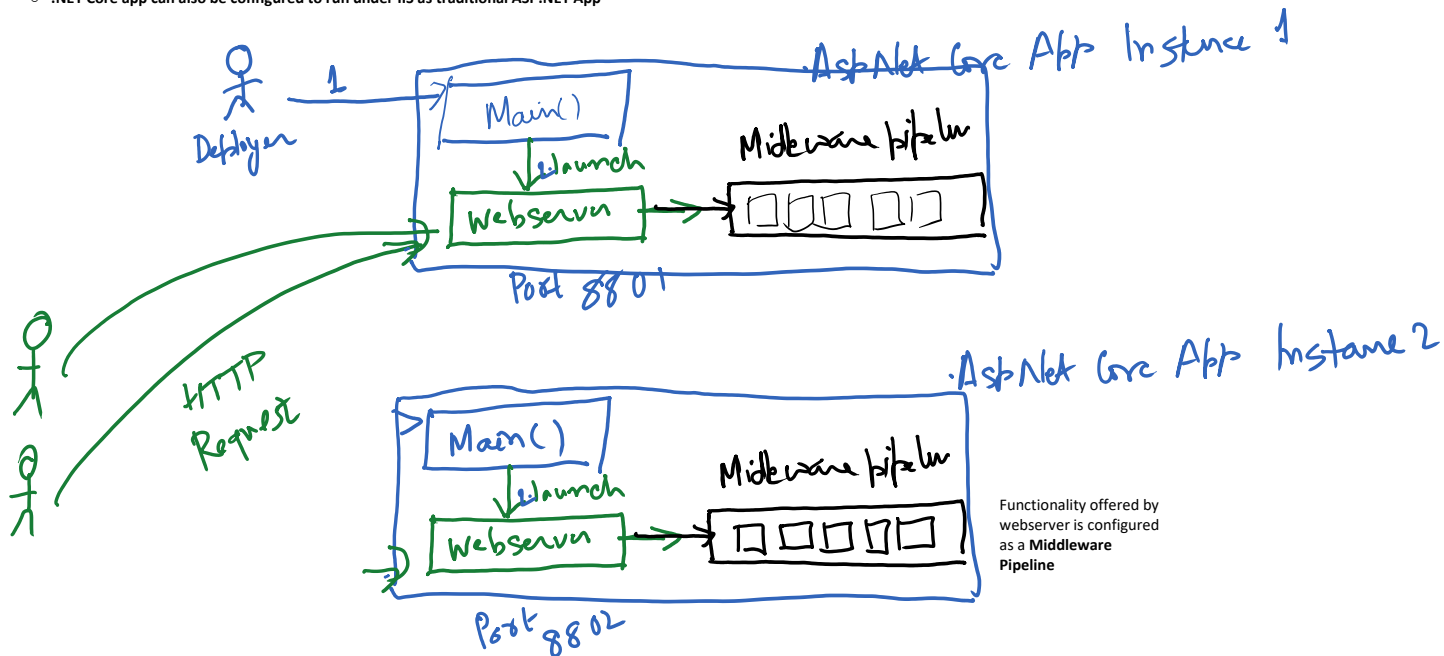
Full .NET Framework is also available on other platforms by contributors like NOVEL (Project MONO). But Neither Microsoft ever attempted to make it corss platform nor there are many takers for it in non-microsoft world!
  - Restructure design to support scalable features for
    - MVC Application
    - WebAPI
    - Entity Framework
  - Highly configurable
  - Zero Installation
    - .NET core runtime may be embeded within your application
    - Application can run anywhere.
    - Less deployment problems!

**.NET Core 2 onward  
the runtime can be installed on  
deployment mechine running any OS**

# ASP.NET Core

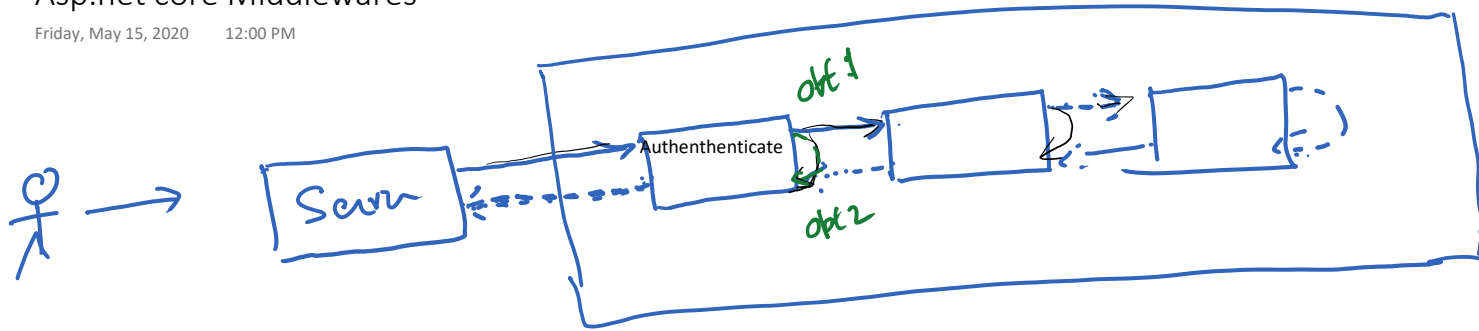
Friday, May 15, 2020 11:31 AM

- ASP.NET core is different from .NET Core in the sense
  - It is **not container architecture**
  - Your application doesn't run inside IIS (or a server)
  - Your application runs (lightweight) server inside it
  - Your application is more like a console application with its own Main
    - When you run Main(), it launches an IIS Server
      - Very easy to deploy. Just run Main
        - ♦ Remember a traditional ASP.NET Web Applications don't have their functions.
      - Since Server is embedded the underlying machine just need .NET Core framework on NOT IIS
      - Your machine listens to its own request and responds back on its
    - You may run multiple instances of your application on same machine (may be different port)
  - Your application contains
    - Server
    - Web Application
  - The server is not heavy weight structure like IIS
  - .NET Core app can also be configured to run under IIS as traditional ASP.NET App



# Asp.net core Middlewares

Friday, May 15, 2020 12:00 PM



<http://mmt.com/search/flights/blr-delhi/2020-06-06>

```
class SearchController{

    public async void Flights(String route, DateTime date)
    {
        //step 1. search flights with different airlines
        //step 1.1 --> AirIndia
        var result1=await airIndia.Search(route,date);
        //step 1.2 --> GoIndigo
        var result2=await goIndigo.Search(route,date);
        //step 1.3 --> Spicejet
        var result3=await spicejet.Search(route,date);

        //step 2. aggregate them together
        var mergedResult=ResultMerger.Merge(result1,result2,result3);

        //step 3. return the response

    }
}
```

what happens to current thread while result is being processed by other server?

1. It should remain idle.
2. **It may be used to process some other request by some other client --> async programming.**



# .NET Core USE

Monday, May 18, 2020 10:23 AM

## Request Delegate

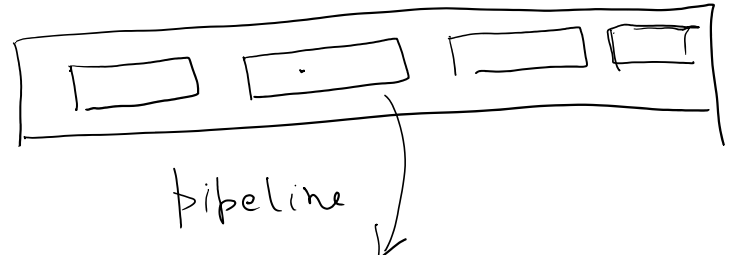
- A Request delegate is a handler or the actual object that can process request.
- It gets an HttpContext and it can process the request and return the response.

## Middleware

- Is a component in the request pipeline.
- It configures a piece of **RequestDelegate**
- Middleware can be considered as a wrapper over RequestDelegate
- The term Middleware/Request delegate is often be used interchangeably

```
public RequestDelegate Middleware(RequestDelegate next)
{
    if(some_condtion)
        return new_delegate; //action performed by this middleware
    else
        return next ; //pass the control to the next middleware
}
```

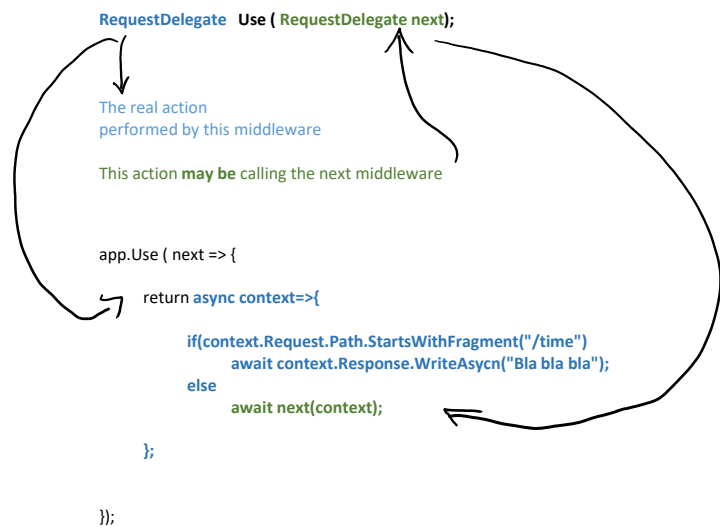
- Here next refers to next middleware in the pipeline
- The middleware conditionally **returns** either can --
  - pass request to the next element in the pipeline
  - or return a new delegate representing the action



Key role of a middleware is one of these two

1. Process the request
2. Pass it to middle ware

- Some middlewares may do both.
- But everyone must do at least one of the two



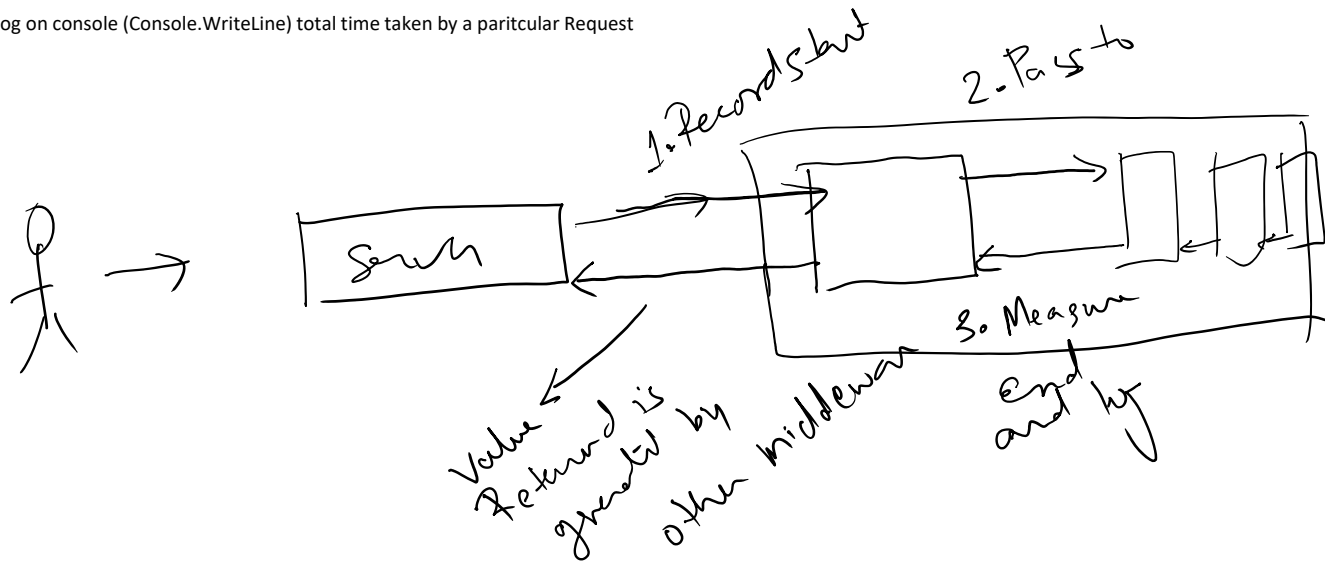
Incase you can't handle the request please pass to next middleware in pipeline and don't break the chain!

## Assignment -- Performance Middleware (Filter)

Monday, May 18, 2020 10:40 AM

Create a Performance Logging middleware

- should log on console (Console.WriteLine) total time taken by a particular Request



# Assignment2 --> Generic Helper to Configure A Url based Middleware

Monday, May 18, 2020 11:13 AM

```
app.Use(next =>
{
    //This is the middleware
    return async context =>
    {
        if (context.Request.Path.StartsWithSegments("/time"))
        {
            await Task.Delay(2500);
            var date = DateTime.Now;
            await context.Response.WriteAsync(date.ToLongTimeString());
        }
        else
        {
            await next(context);
        }
    };
});
```

In this code there are few common steps

1. check the URL
  - a. If Url matches then perform a **execute RequestDelegate**
  - b. **else** execute **next() delegate**

Write a helper

1. which can take URL and RequestDelegate as parameter
2. Invokes your RequestDelegate if parameter matches
3. Invokes Next delegate (not passed as parameter) if url is a mismatch

# Assignment UseBefore and UseAfter

Monday, May 18, 2020

11:45 AM

Follow the Idea of Middleware

public static class MiddleWares

```
{
    public static void UseMappedUrl(this IApplicationBuilder app,string url, RequestDelegate handler)
    {
        //This is the middleware
        app.Use(next =>
        {
            //This is the middleware
            return async context =>
            {
                if (context.Request.Path.StartsWithSegments(url))
                {
                    await handler(context);
                }
                else
                {
                    await next(context);
                }
            };
        });
    }
}
```

## Create Helpers for Filters that can run before after next in pipeline.

- The pipeline shall execute
- Before executes a code before passing to next pipeline
- After executes a code after executing next pipeline

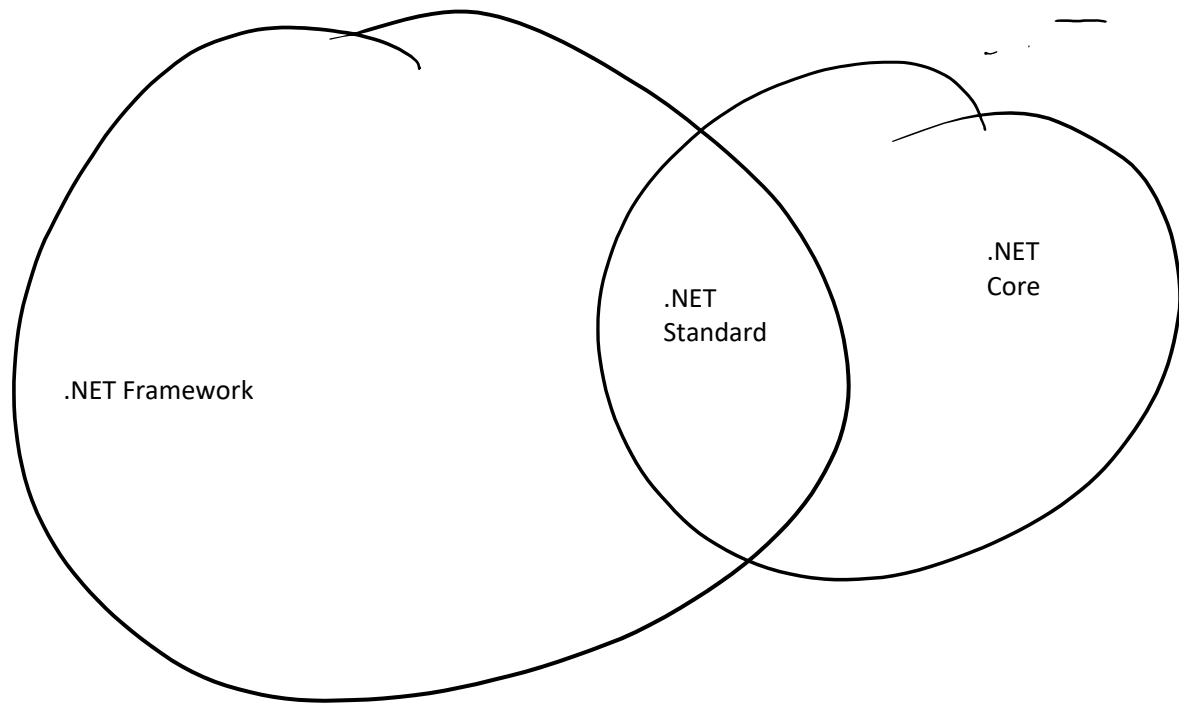
app.Use

Before(async context =>

```
{
    Console.WriteLine("Request: " + context.Request.Path);
    //next is called automatically
});
```

app.UseAfter(async context =>

```
{
    //next is called here
    Console.WriteLine("Requested Processed:" + context.Request.Path);
});
```



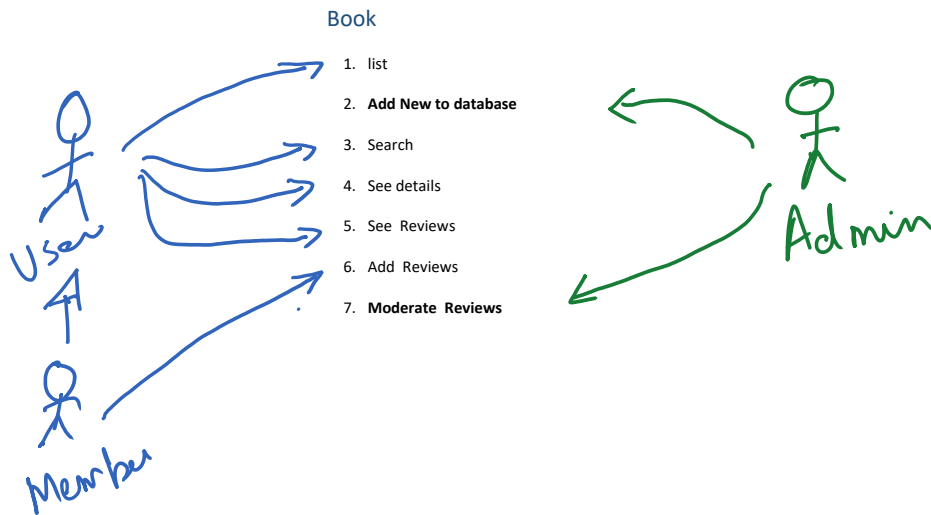
## Key Elements

Book Database Management

Author Database Management

Reviews

User and Authentication



## Urls

### List all books

<https://books.org/book/list>

or

<https://books.org/books>

### Search Books

<https://books.org/books?q=TheAccursedGod>

### Create New Book

<https://books.org/books/create>

### Book By Id

<https://books.org/books/info/the-accursed-god>

### Edit Book

<https://books.org/books/edit/the-accursed-god>

### Edit Book

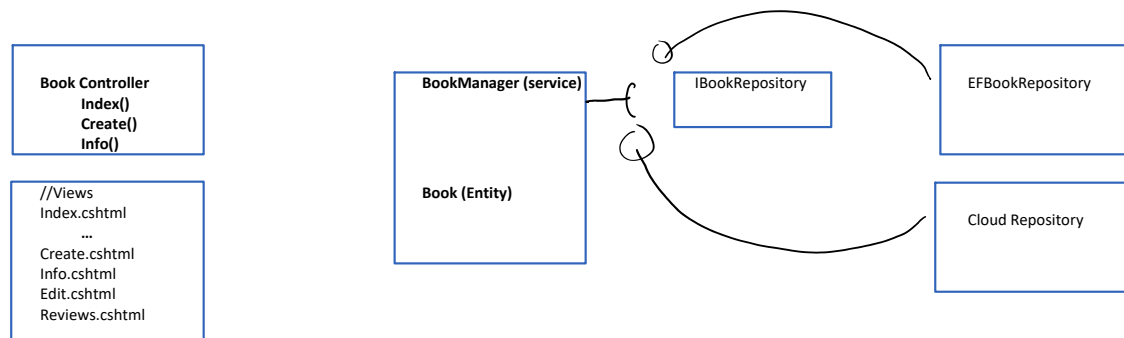
<https://books.org/books/delete/the-accursed-god>

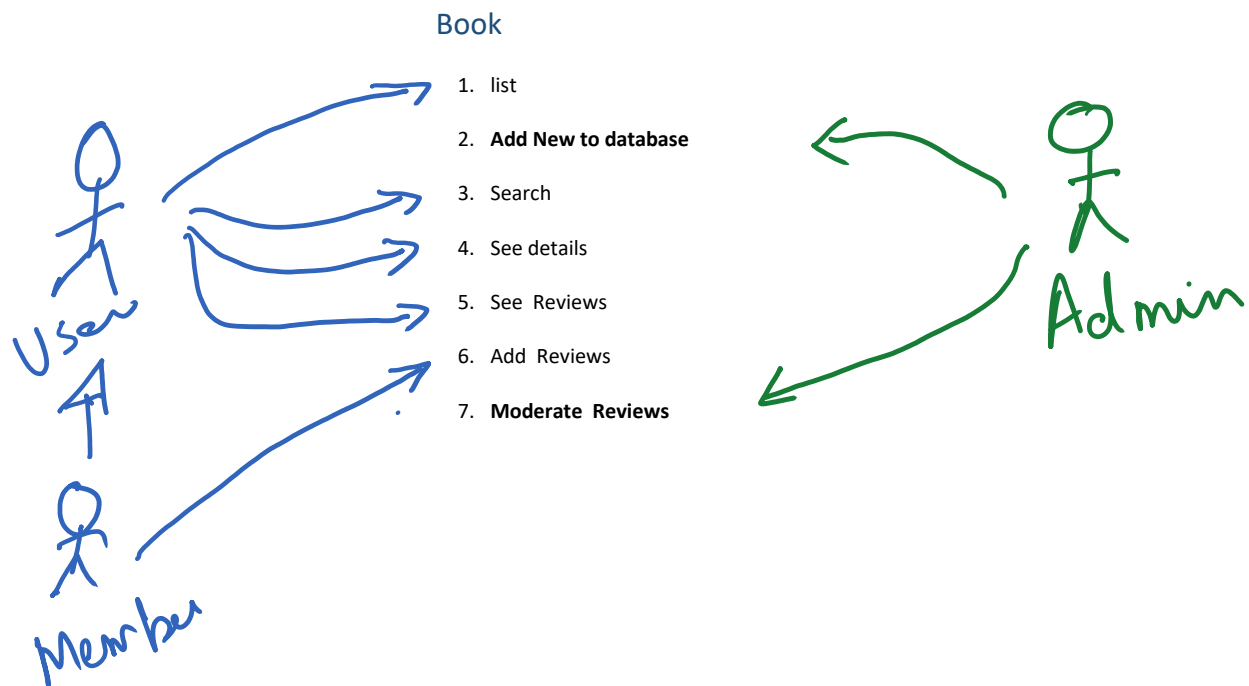
### List of Book Reviews

<https://books.org/books/reviews/the-accursed-god>

alt

<https://books.org/books/info/the-accursed-god/reviews> <--- Note requires a New Route



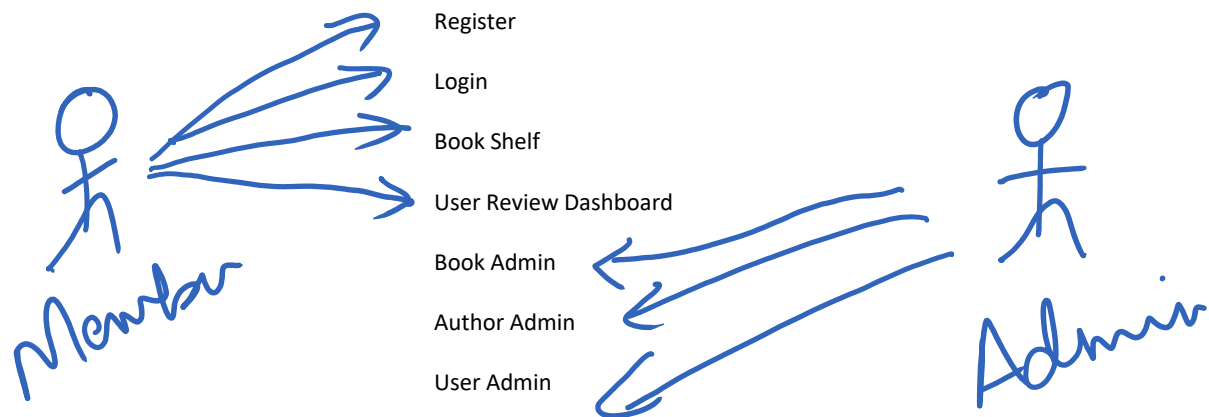




# User

Friday, May 15, 2020

8:45 AM



# Controller (Bad Design)

Monday, May 18, 2020 12:51 PM

```
class BookController
{
    public ActionResult BookList(){
    }
    public ActionResult AuthorList(){
    }
    public ActionResult UserRegister(){
    }
    public ActionResult UserLogin(){
    }
}
```

<https://books.org/book/booklist> <---- book is repeated twice

<http://books.org/book/authorlist> <--- book is not required in url

<http://books.org/book/userlogin> <----- book is not required in url

*Don't use this*

# Controller

Monday, May 18, 2020 12:51 PM

```
class class BookController
{
```

```
    public ActionResult List(){
```

```
    }
```

```
    public ActionResult Info(String id){
```

```
    }
```

```
}
```

```
public class AuthorController{
```

```
    public ActionResult List(){
```

```
    }
```

```
    public ActionResult Info(string id){
```

```
    }
```

```
}
```

```
public class UserController{
```

```
    public ActionResult Register(){
```

```
    }
```

```
    public ActionResult Login(){
```

```
    }
```

```
}
```

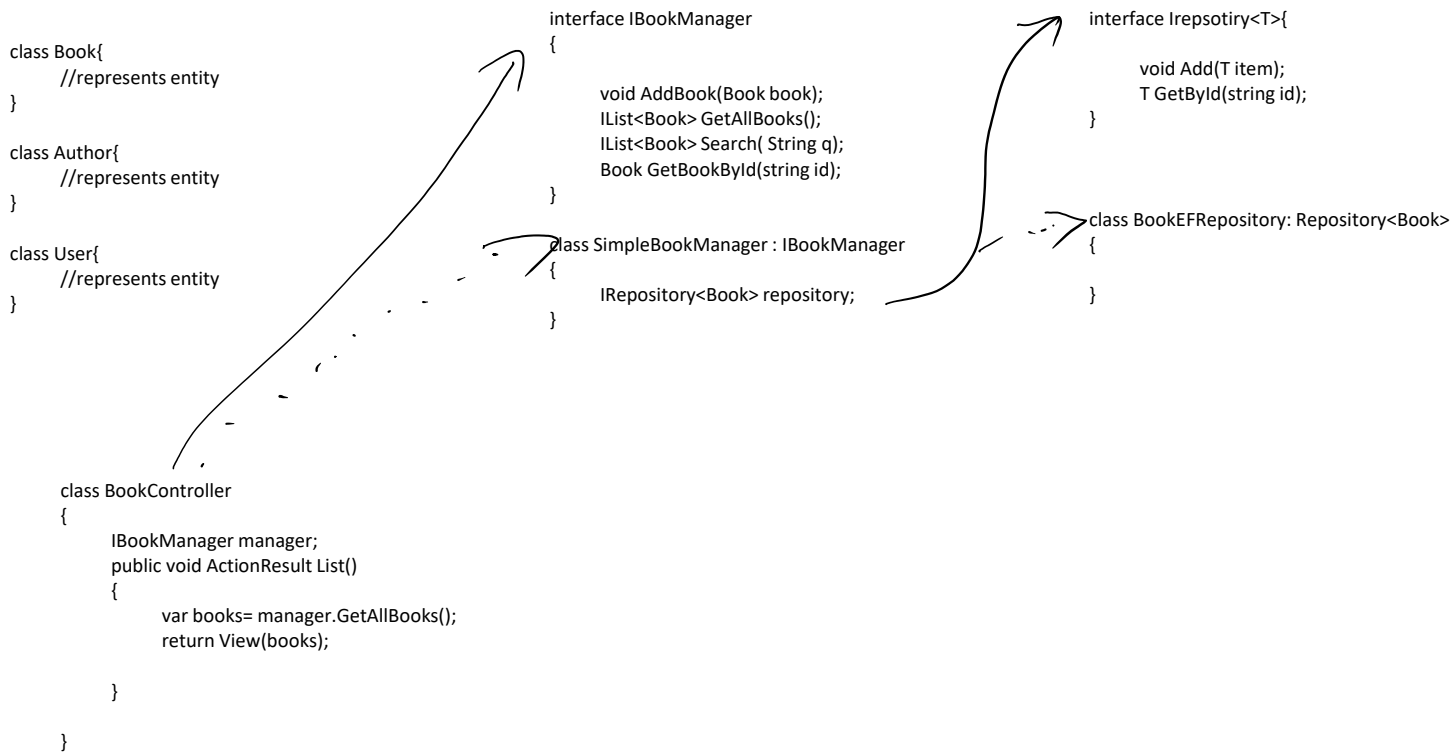
<https://books.org/book/list> <---- book is repeated twice  
<https://books.org/book/info/the-accursed-god>

<https://books.org/author/list>  
<https://books.org/author/info/jeffrey-archer>

<https://books.org/user/register>  
<https://books.org/user/login>

# Architecture

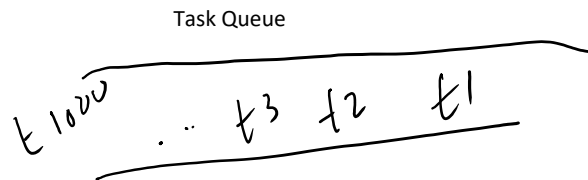
Monday, May 18, 2020 12:57 PM



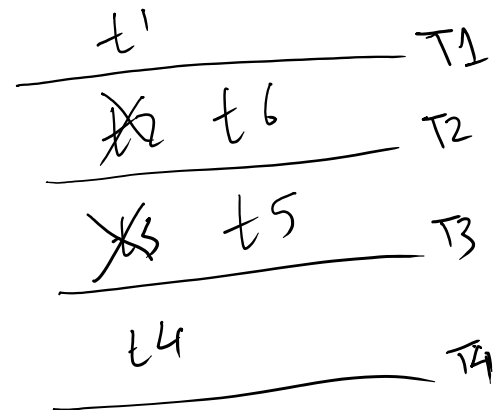
# Task

Tuesday, May 19, 2020 9:16 AM

- Lightweight abstraction of Asynchronous programming
- Represents a piece of job that should work asynchronously
- Tasks executes on a Threadpool



## Thread Pool



# Task and async programming

Tuesday, May 19, 2020 9:22 AM

- A Task is a piece of long running job whose result may come later
- We are no sure when the result will come!

```
int CountPrimes(int min,int max){  
  
    int count=0;  
    for(int i=min;i<max;i++){  
        if(IsPrime(i))  
            count++;  
    }  
  
    return count;  
}
```

counting primes between 2-5lack may take upto 40 seconds.

//Scenario #1

```
void Main(){  
  
    int r1= CountPrimes(2,500000);  
  
    int r2=CountPrimes(2,500);  
    print(r1);  
    print(r2);  
  
}
```

second calculation is smaller than the first one and are unrelated. There is no need for second to wait for first to finish. But we wait on first line to be over before we move to second line.

**This is synchronous programming**

//Task based design  
void Main(){

Task<int> t1=Task.Factory.StartNew( ()=> CountPrimes(2,500000));

Task<int> t2= Task.Factory.StartNew( ()=> CountPrimes(2,100));

Task sleep=LongSleep();

//both tasks have started together and second may end before first  
t2.Wait();  
print(t2.Result);

//t1.Wait(); //----> blocks current execution till Task is complete. Main **waits** for task to complete  
print(t1.Result);

}

public Task LongSleep(){

return Task.Factory.StartNew(()=> Thread.Sleep(10000));

}

# Task vs async await

Tuesday, May 19, 2020 9:32 AM

```
int CountPrimes(int min, int max)
{
    int count=0;
    for(int i=min;i<max;i++){
        if(IsPrime(i))
            count++;
    }

    return count;
}
```

```
Task<int> CountPrimesAsync(int min, int max)
{
    return Task.Factory.StartNew(()=> CountPrime(min,max));
}
```

```
public Task LongSleep(){
    return Task.Factory.StartNew(()=> Thread.Sleep(10000));
}
```

```
//This is a sync call around a Task
int FindPrimes(int min, int max)
{
    var pt=CountPrimesAsync();
    pt.Wait(); //this function waits. and this function is sync
    return pt.Result;
}
```

```
void Main(){
    var result=FindPrimes(2,50000)
    //you reach here only when the job is over.
    print(result);
}
```

```
Task<int> FindPrimesAsync(int min, int max)
{
    var pt=CountPrimesAsync();

    return pt;
}
```

```
void Main(){
    Task<int> result=FindPrimesAsync(2,50000)
    //you reach here before the job is over.

    //you should wait for the job to be over
    result.Wait();
    print(result.Result);
}
```

**async int** FindPrimesAsync(int min, int max)

```
{
    var pt=CountPrimesAsync();

    var result = await pt; //someone else will wait for it
    return result;
}
```

async  
automatically  
wraps  
result  
in a Task

the function  
is actually  
returning

Task<int>

because you  
await Task<int>

```
void Main(){
    Task<int> result=FindPrimesAsync(2,50000)
    //you reach here before the job is over.

    //you should wait for the job to be over
    result.Wait();
    print(result.Result);
}
```

//result will be an int. so I am actually returning Task<int>

- Any function that has an await anywhere in its body will always be a task as there is something awaited
- **await** need not be part of return statement
- if a function that has await returns a value of type **double** it means it actually returns a **Task<double>**
- if a function that has await returns **no value** it actually returns **Task**
- **await can be a part of the function that has async in the signature!**
  - **Main()** can't have **async await**
  - **Main()** must wait **sync**

```
async int FindPrimesAsync(int min, int max)
{
    var pt=CountPrimesAsync(min,max);

    var result = await pt; //someone else will wait for it

    return result; //returns Task<int>
}
```

```
async void PrintPrimeAsync(int min, int max)
{
    var result= await CountPrimesAsync(min,max);

    Console.WriteLine("Total primes between {0}-{1} is {2}",min,max,result);
}

void Main()
{
    Task t=PrintPrimeAsync(2,50000); //this work will finish later
    //I can't await in Main

    t.Wait(); //must actually wait

    Console.WriteLine("End of Program");
}
```

```
Task PrintPrimeAsync(int min, int max)
{
    var task1=CountPrimesAsync(min,max);

    var task2= task1.ContinueWith( r=>{
        Console.WriteLine("Total primes between {0}-
        {1} is {2}",min,max,result);
    });

    returns task2
}
```