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Introduction to ASP.NET

ASP.NET, Architecture, Web Forms, MVC, Web API

ASP.NET Web Forms

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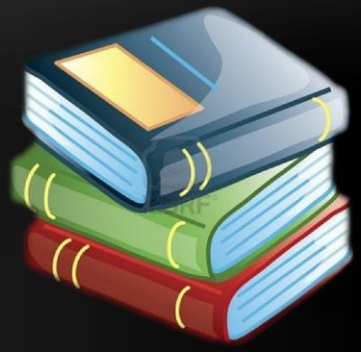

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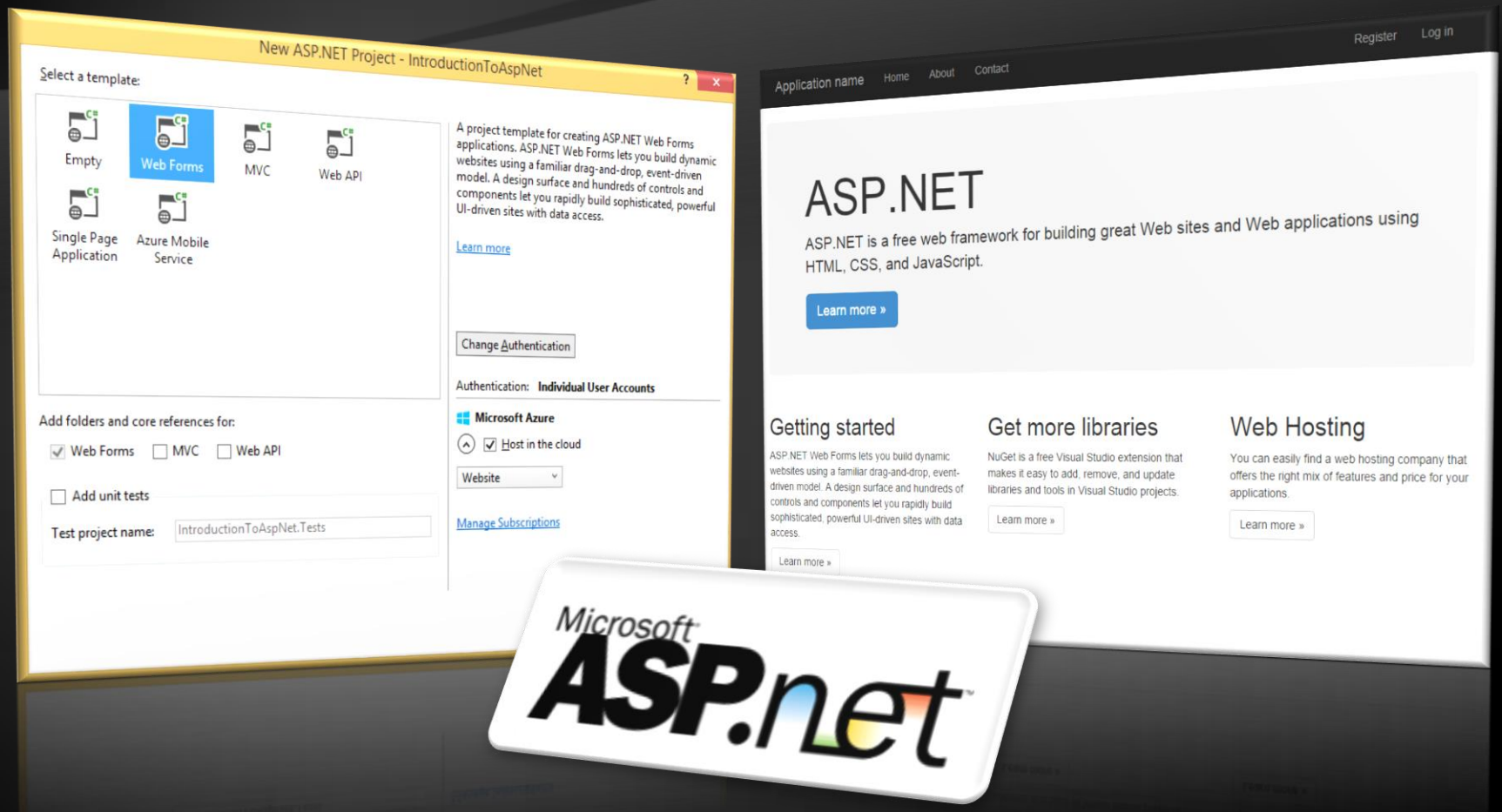
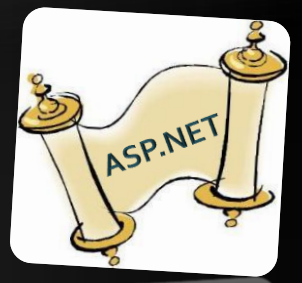


Microsoft ASP.net

Introduction to ASP.NET

History of ASP.NET

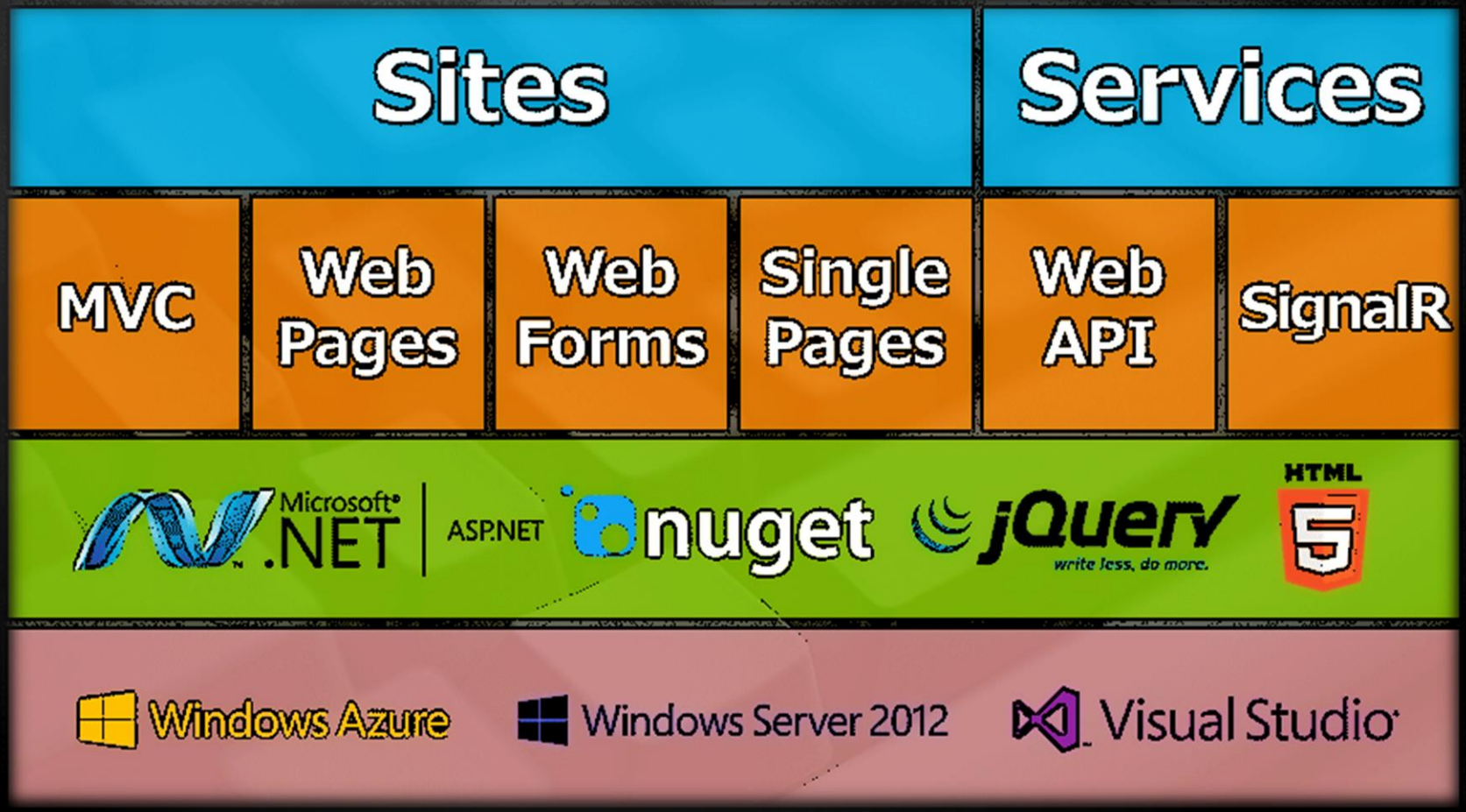
- At the beginning of Internet (up to 1997)
  - CGI, ISAPI (for C, C++), PHP
- Classic / Legacy ASP (1997-2002)
  - Based on VB Script, COM, ADO



- ASP.NET 1.0 (2002, January 16) – with .NET 1.0
- ASP.NET 1.1 (2003-2005) – based on .NET 1.1
- ASP.NET 2.0 (2005-2007) – based on .NET 2.0
- ASP.NET 3.5 (2007-2009) – LINQ to SQL, MVC
- ASP.NET 4.0 (2010) – Entity Framework, MVC
- ASP.NET 4.5 (2012) – One ASP.NET (info)
- ASP.NET vNext (2014) – Redesigned (info)

What is ASP.NET?

- ASP.NET is a stack of technologies to create web sites, web services and web applications



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ASP.NET: Web Forms vs. MVC

- ASP.NET has two major frameworks for Web application development
  - ASP.NET Web Forms (read more)
    - The traditional component-based approach
    - Mixes the presentation and presentation logic
  - ASP.NET MVC (read more)
    - Modern approach, more clear and flexible
    - MVC architecture, like Ruby-on-Rails and Django
    - Testable (test the controllers)

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ASP.NET: Web Pages, Web API

- ASP.NET Web Pages (read more)
  - Lightweight framework to combine server code with HTML to create dynamic web content
    - Like PHP: mix HTML code with C# code
    - Uses the "Razor" templating engine
- ASP.NET Web API (read more)
  - Framework for building RESTful Web services
    - Write C# code to handle HTTP requests in REST style (GET / POST / PUT / DELETE requests)
    - Return JSON / XML as result

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ASP.NET: SPA, SignalR

- Single Page Applications (SPA) (read more)
  - Combine Web API with client-side JS
  - Write a HTML5 single page apps with jQuery / Knockout.js / other JS client-side framework
  - Client HTML5 code consumes Web API services
- SignalR (read more)
  - Real-time communication between client (JS) and server (C#) over HTTP through Web Sockets
    - Server C# code can invoke JS functions at the client
    - Client JS code can invoke C# methods at the server

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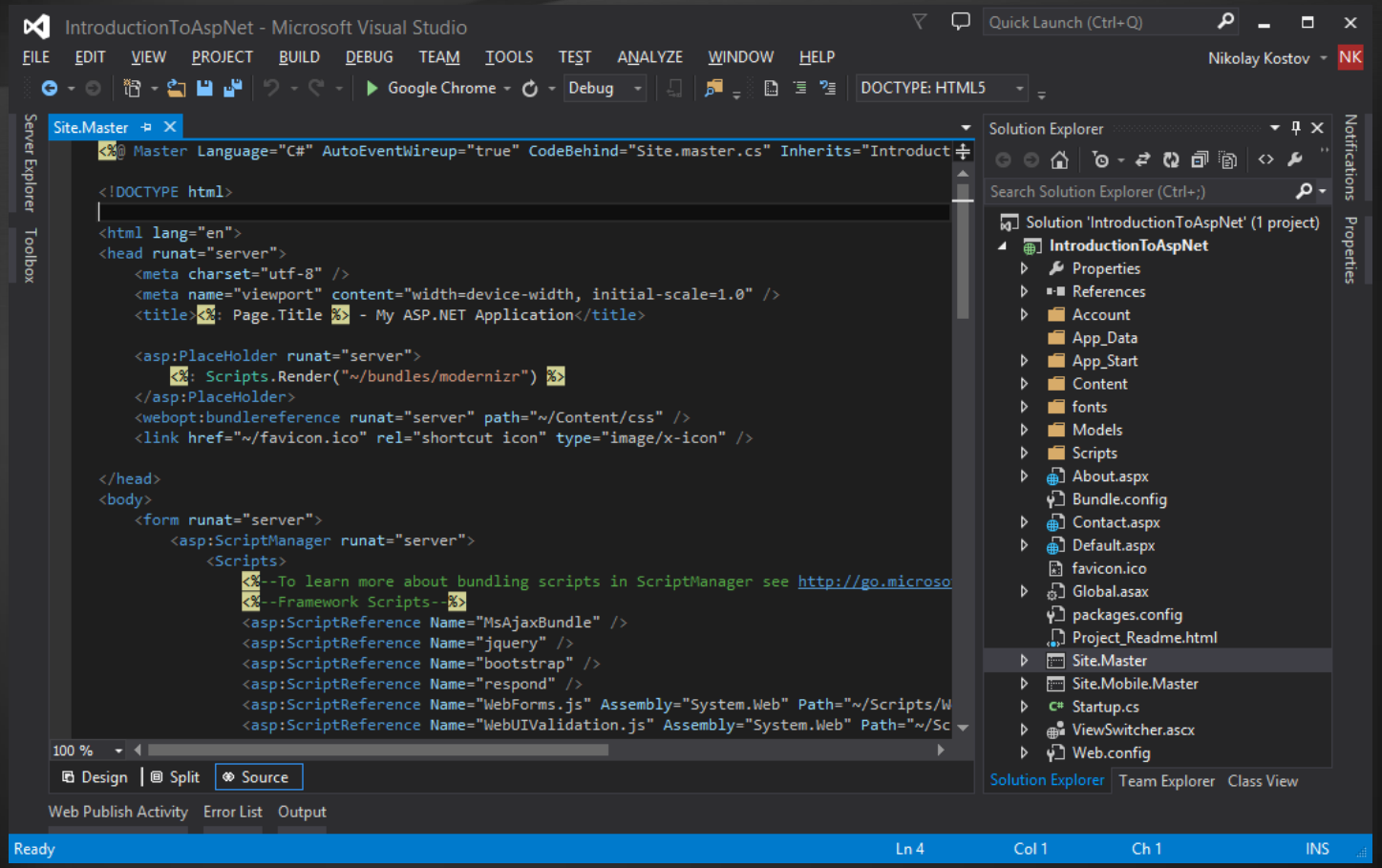

Simple Web Forms App

Live Demo

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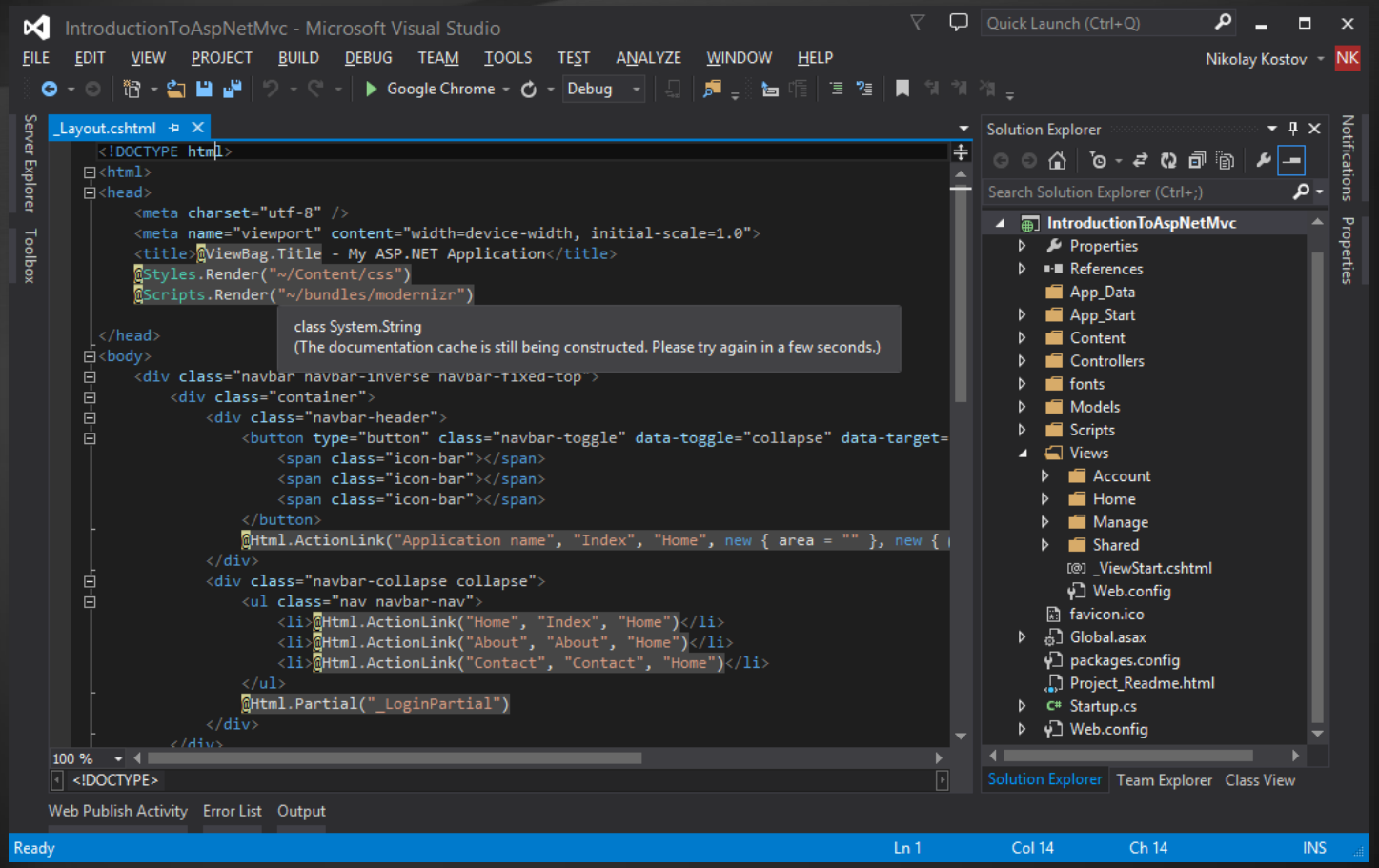

Simple MVC App

Live Demo

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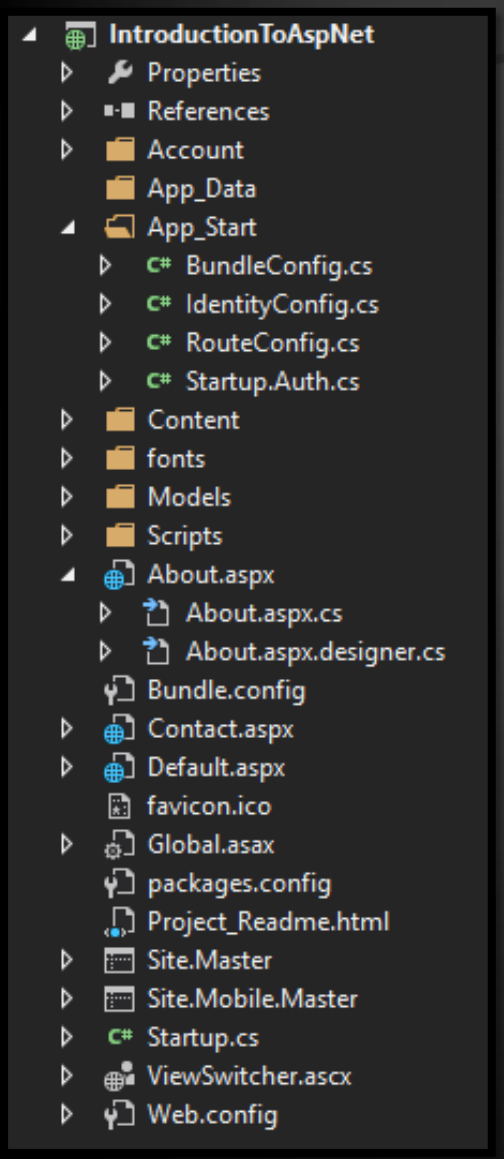
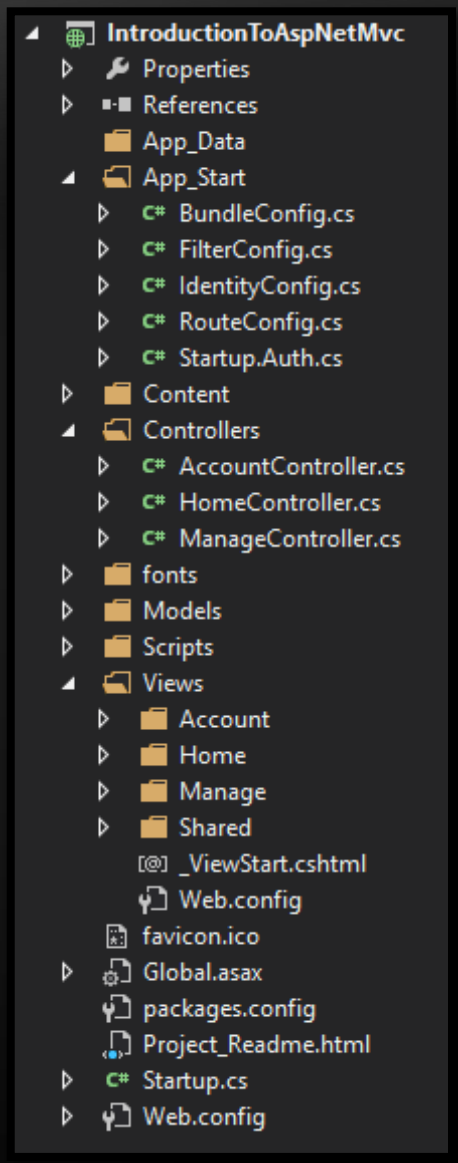
ASP.NET App Structure

Typical Application Structure in ASP.NET





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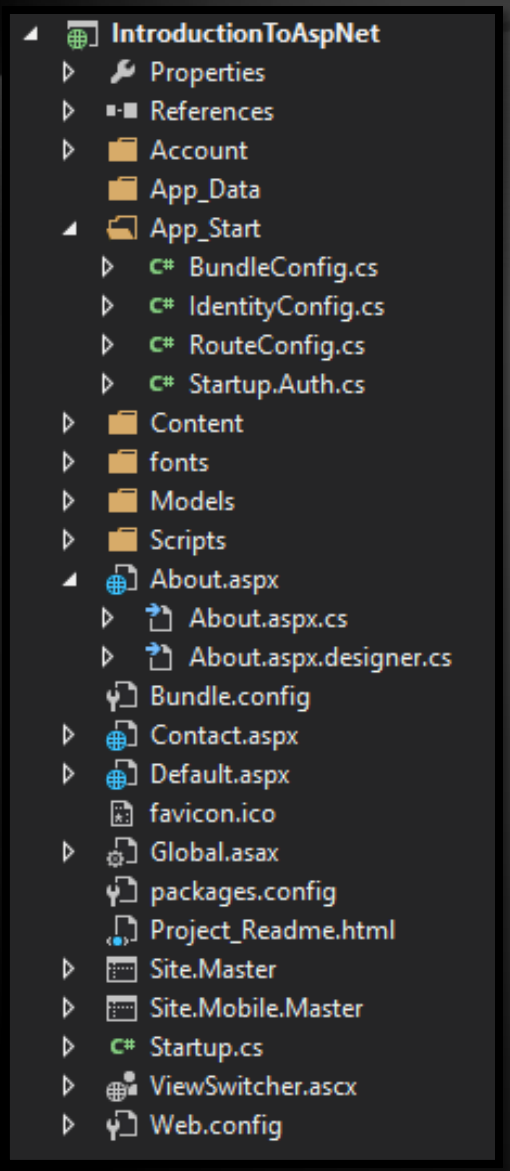
ASP.NET App Structure



- App_Start
  - BundleConfig / RoutesConfig / IdentityConfig / Startup.cs
- App_Data
- Web.config
- Global.asax
- Content and Content\themes
- Scripts, img, fonts
- Models / Views / Controllers
- Site.Master / Site.Mobile.Master

App_Start

- The `App_Start` folder
  - Holds global configuration logic
  - Classes that are loaded at application start-up
- `BundleConfig.cs` (read more)
  - Combines and optimizes CSS and JS files
- `FilterConfig.cs` (read more)
  - Configures filters in MVC / Web API apps
  - Configures pre-action and post-action behavior to the controller's action methods

App_Start (2)

- `RouteConfig.cs` (read more)
  - Configures URL patterns and their handlers
  - Maps user-friendly URLs to certain page / controller
- `IdentityConfig.cs` / `Startup.Auth.cs`
  - Configures the membership authentication
    - Users, roles, login, logout, user management
  - OAuth login (cross-sites login, read more)
    - Facebook / Twitter / Microsoft / Google login

App_Data

- The App_Data directory holds the local data files of the Web application
  - E.g. `MyWebApp.mdf` + `MyWebApp.ldf`
  - E.g. `Countries.xml`
- The SQL Server "Local DB" (read more)
  - Local `.mdf` + `.ldb` files, attached at startup
  - SQL Server process started on demand
  - Database created on demand (if missing)
  - Great for development and testing

Web.config

- `Web.config` is web app's configuration file
  - Holds settings like DB connection strings, HTTP handlers, modules, assembly bindings
  - Can hold custom application settings, e.g. credentials for external services
  - Changes in `Web.config` do not require rebuild
- You may have several `Web.config` files
  - One global for the application
  - Several for different folder in the application

Web.config (2)

- Web.config inherits from the global Web.config and from machine.config
  - Global settings for all applications on the server

```
C:\Windows\Microsoft.NET\Framework\v4.0.30319\Config\machine.config
```

- Web.Debug.config
  - Local settings for debugging
  - E.g. local database instance for testing
- Web.Release.config
  - Production settings for real world deployment

Web.config – Example

```
<?xml version="1.0" encoding="utf-8"?>
<configuration>
  <configSections>
    <section name="entityFramework"
type="System.Data.Entity.Internal.ConfigFile.EntityFrameworkSection, EntityFramework,
Version=6.0.0.0, Culture=neutral, PublicKeyToken=b77a5c561934e089"
requirePermission="false" />
  </configSections>
  <connectionStrings>
    <add name="DefaultConnection" connectionString="Data
Source=(LocalDb)\v11.0;AttachDbFilename=|DataDirectory|\aspnet.mdf;Initial
Catalog=aspnet;Integrated Security=True“ providerName="System.Data.SqlClient" />
  </connectionStrings>
  <appSettings>
    <add key="webpages:Enabled" value="false" />
    <add key="ClientValidationEnabled" value="true" />
    <add key="UnobtrusiveJavaScriptEnabled" value="true" />
    …
  </appSettings>
  <system.web>
    <compilation debug="true" targetFramework="4.5" />
    …
  </system.web>
  <system.webServer> … </system.webServer>
  <runtime> … </runtime>
  <entityFramework> … </entityFramework>
</configuration>
```

Global.asax

- Global.asax defines the HTTP application
  - Defines global application events like
    - Application_Start
    - Application_BeginRequest
    - Application_EndRequest
    - Application_Error
    - …
  - Typically invokes BundleConfig, RouteConfig, FilterConfig, etc.

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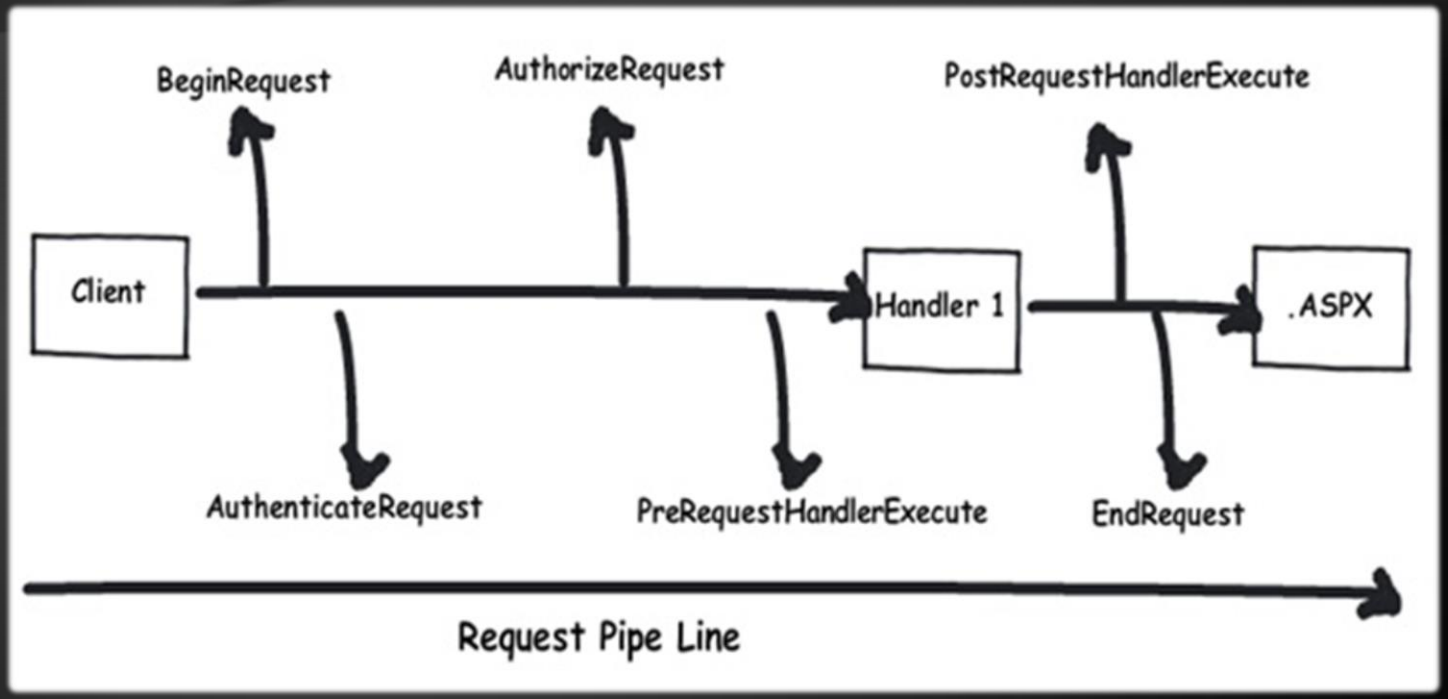

ASP.NET App Lifecycle

Application Lifecycle, HTTP Modules, Handlers, Events, Controllers, Pages, …

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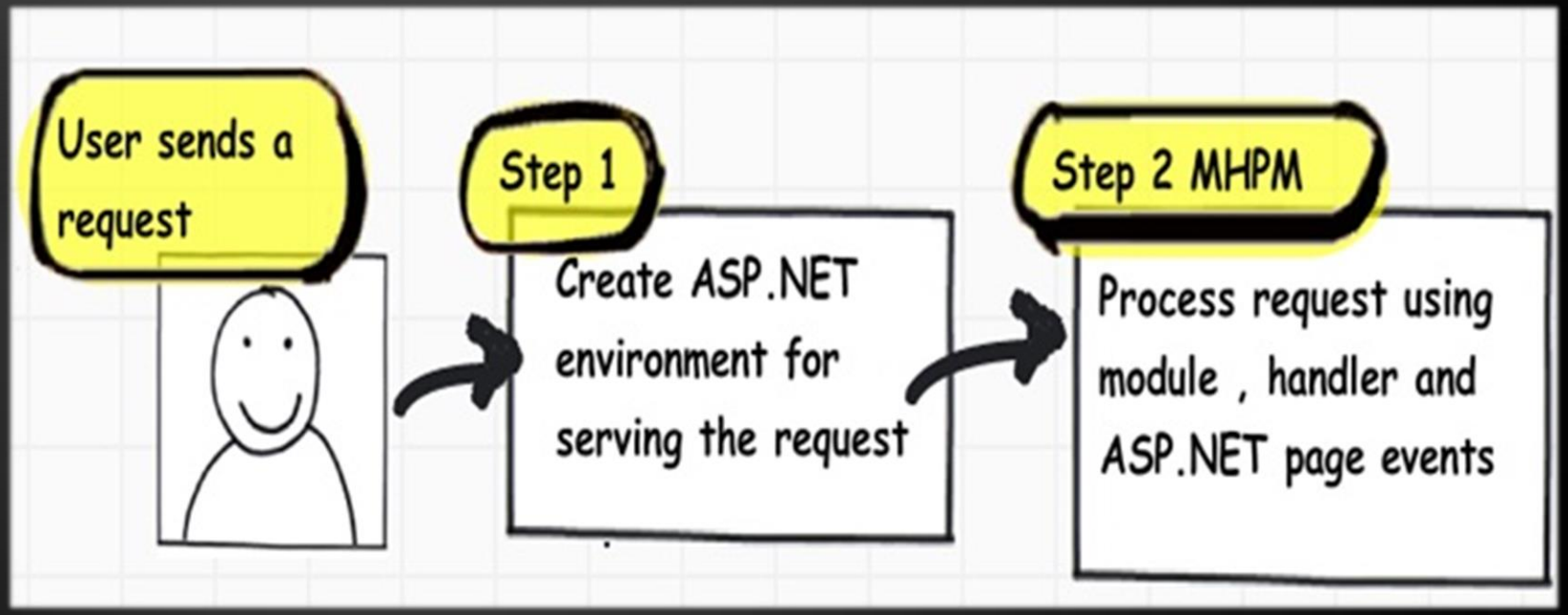
ASP.NET App Lifecycle



- MHPM == Module, Handler, Page Events, Module Events

* Source: http://www.codeproject.com/Articles/73728/ (by Shivprasad Koirala)

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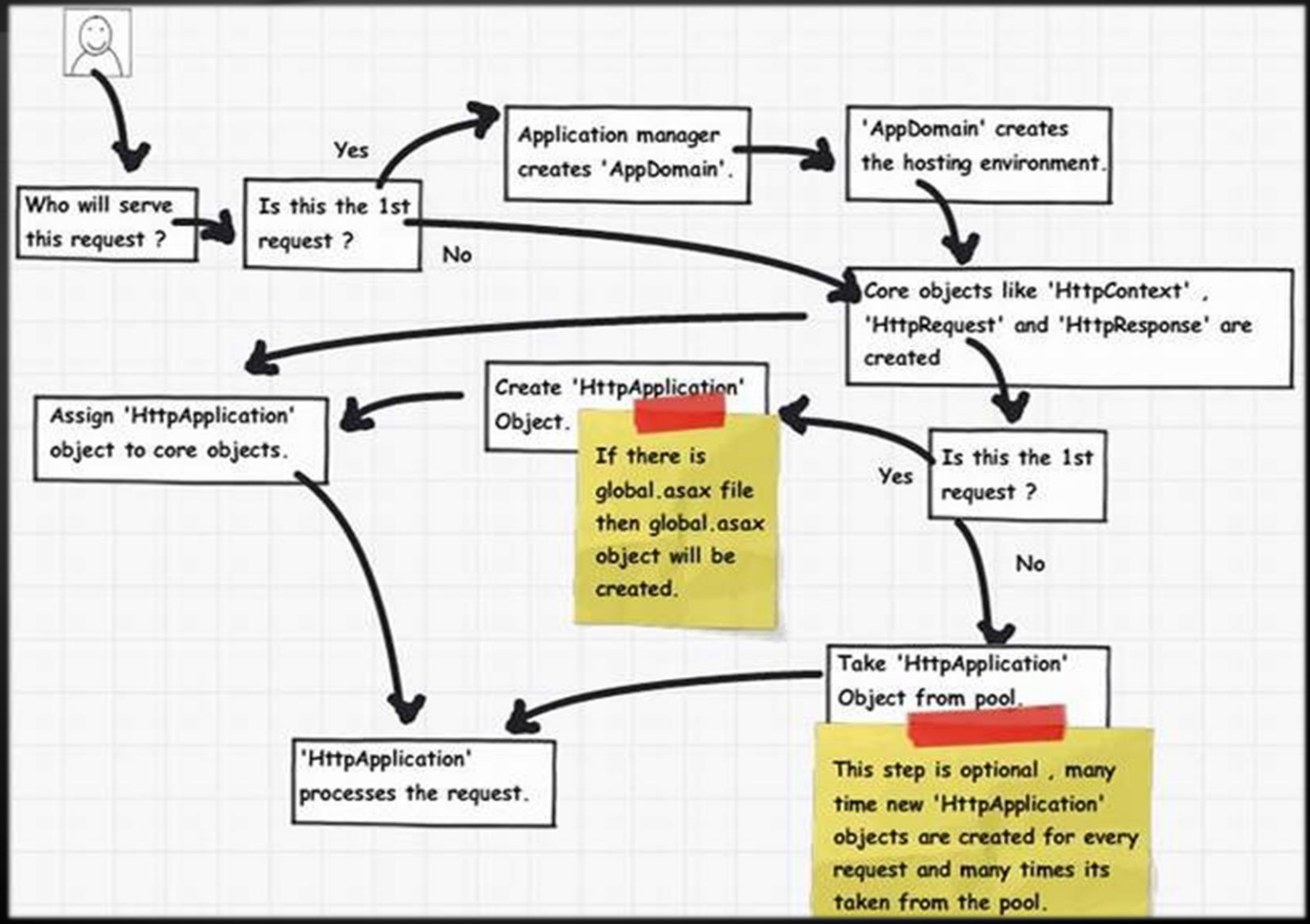
ASP.NET App Lifecycle (2)



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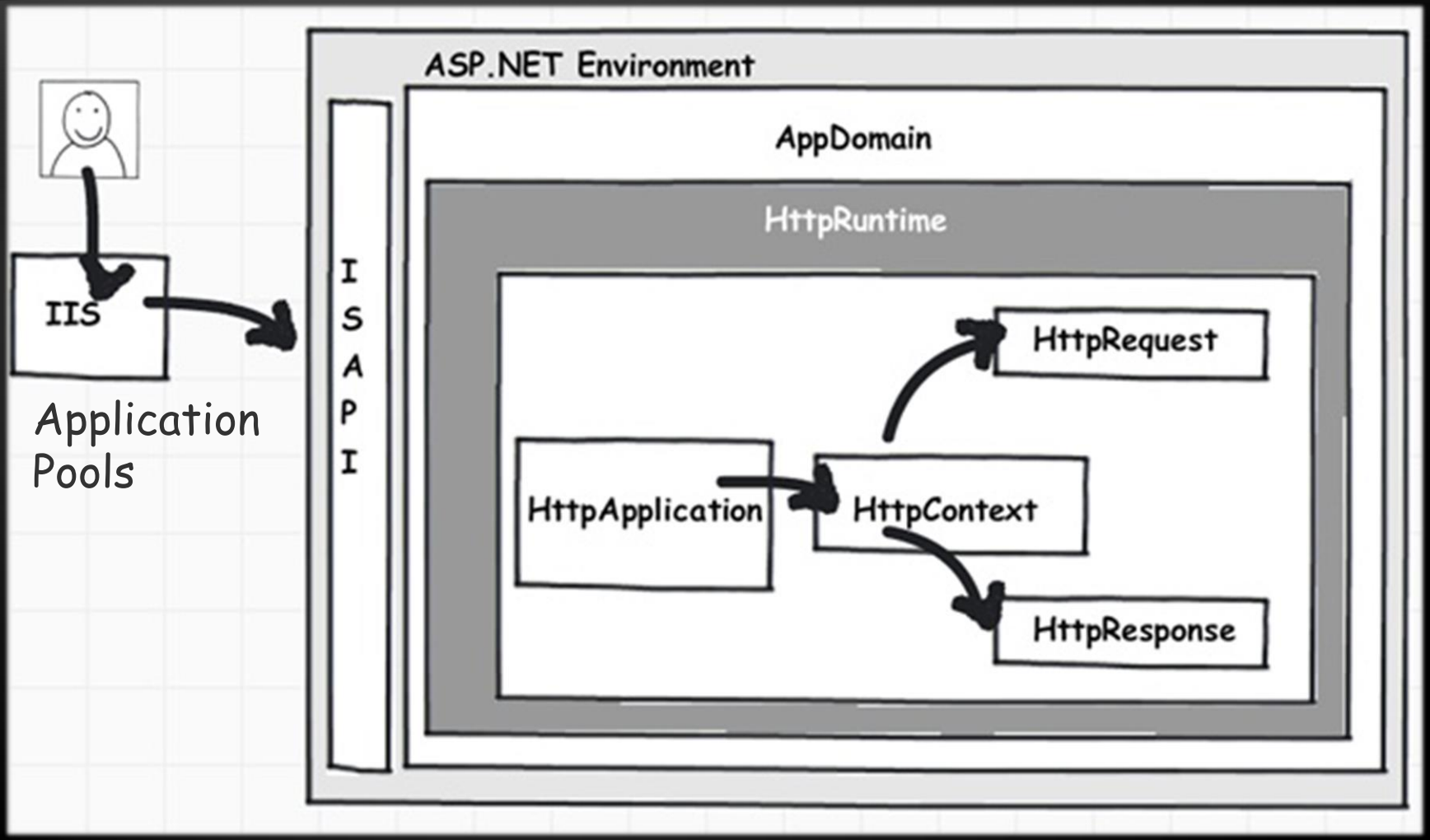
ASP.NET App Lifecycle (3)



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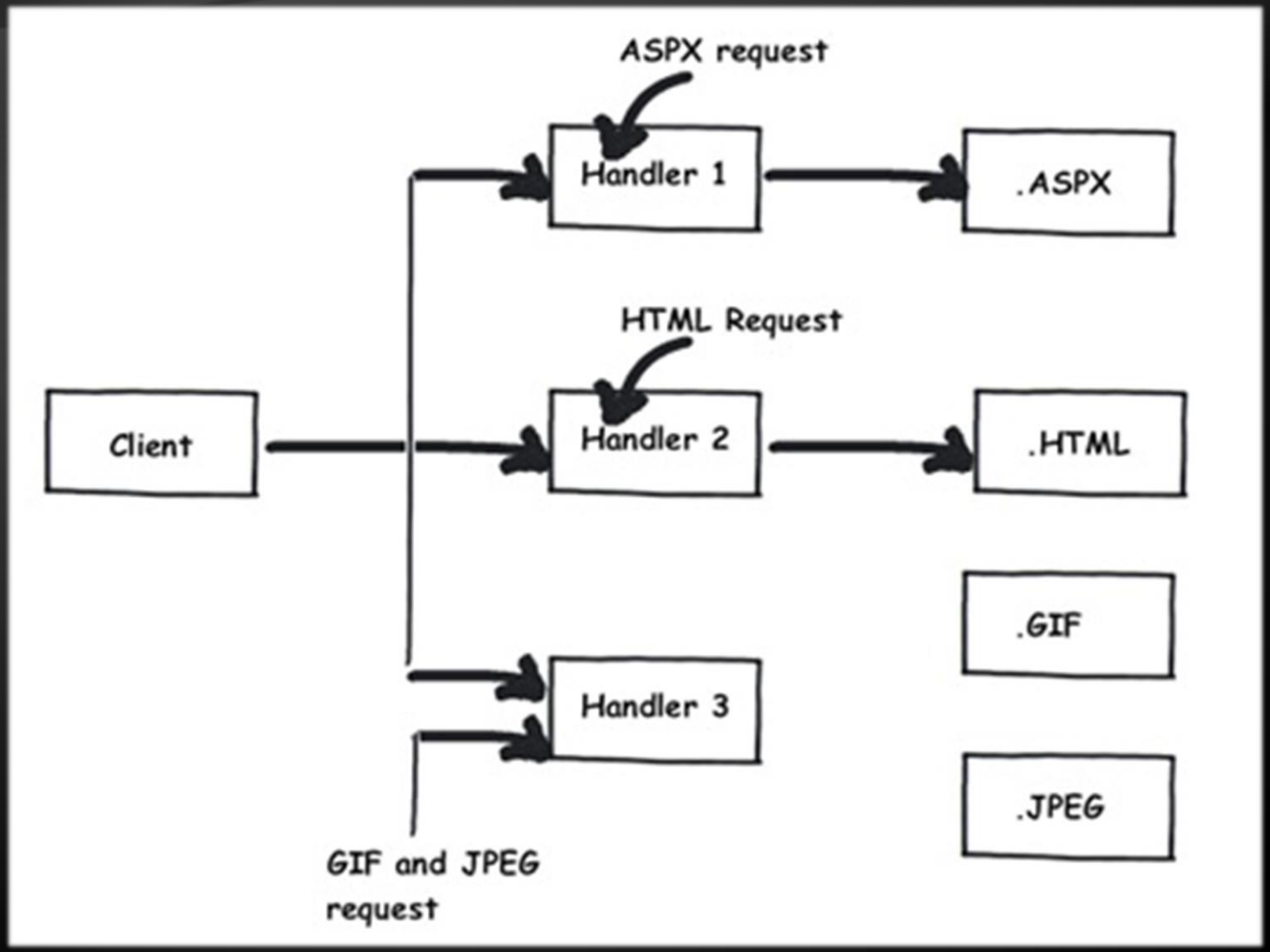
ASP.NET App Lifecycle (4)



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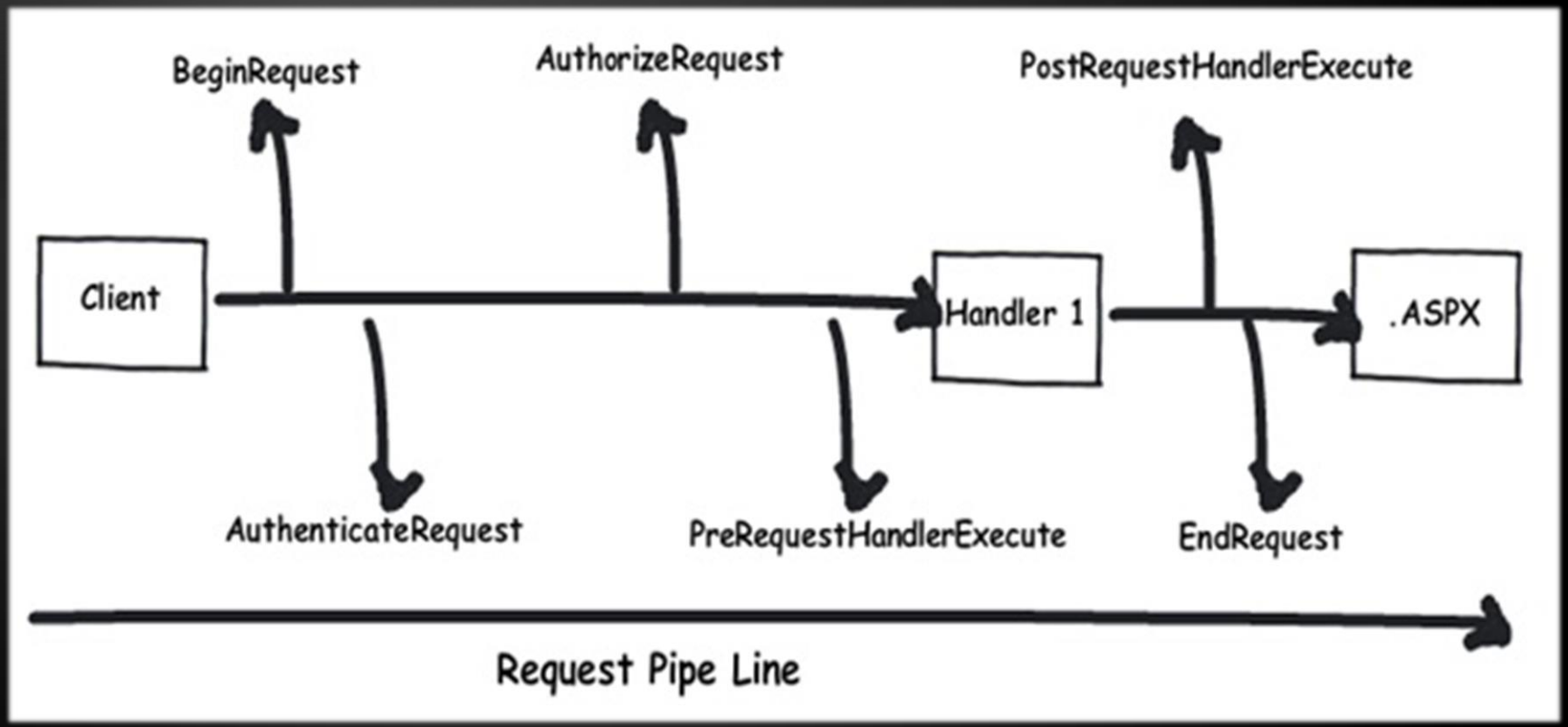
ASP.NET App Lifecycle (5)



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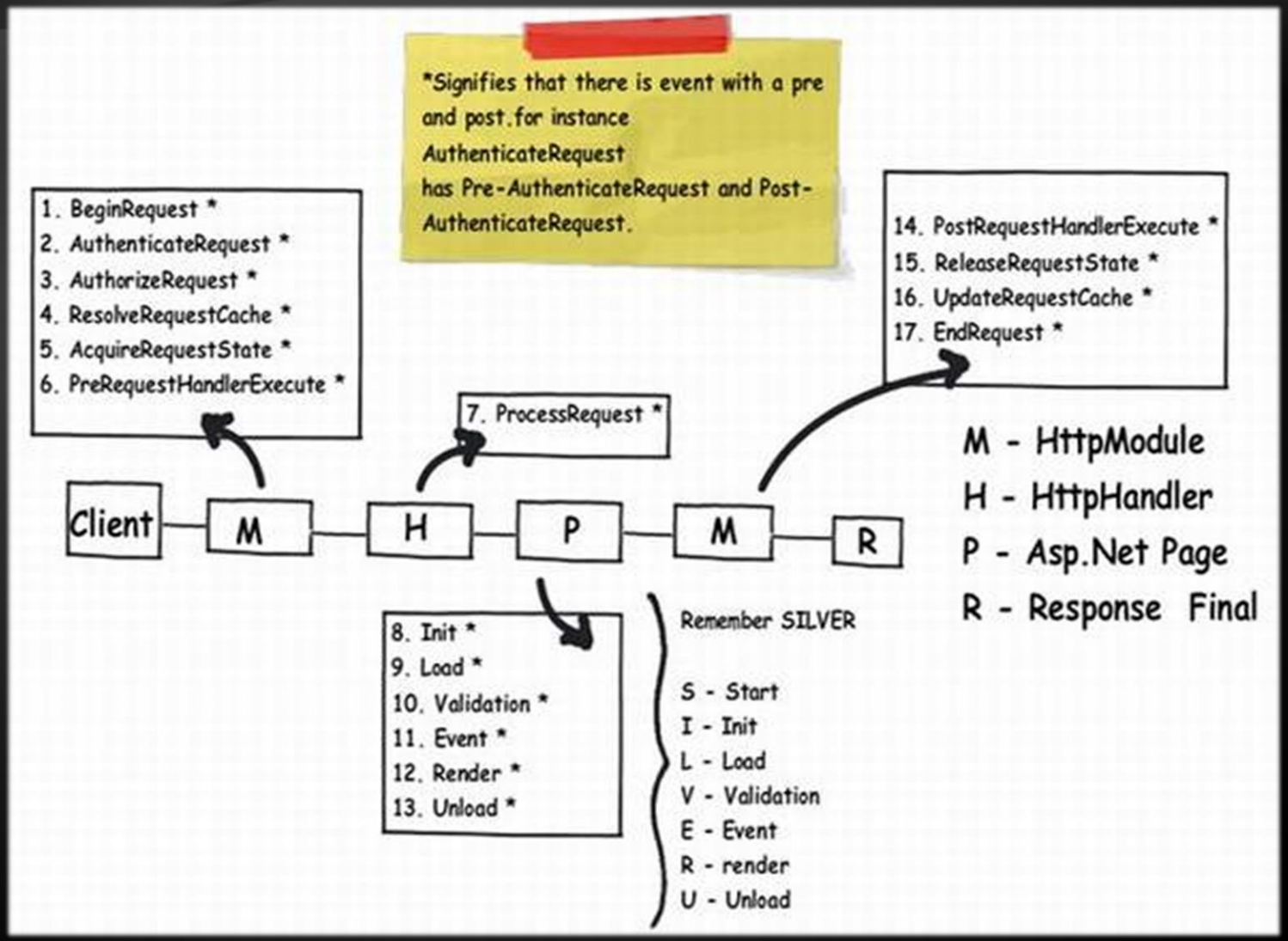
ASP.NET App Lifecycle (6)



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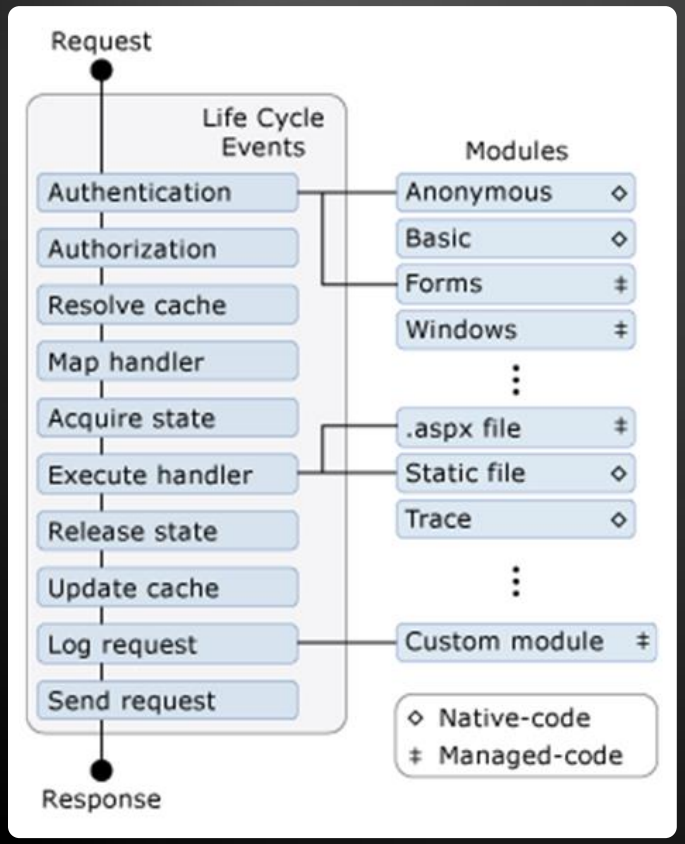
Application Lifecycle Events

- `HttpApplication` have a complex pipeline to the process HTTP requests (read more)



- `BeginRequest`
- `AuthenticateRequest`
- `AuthorizeRequest`
- `AcquireRequestState`
- `ProcessRequest`
- `ReleaseRequestState`
- `EndRequest`

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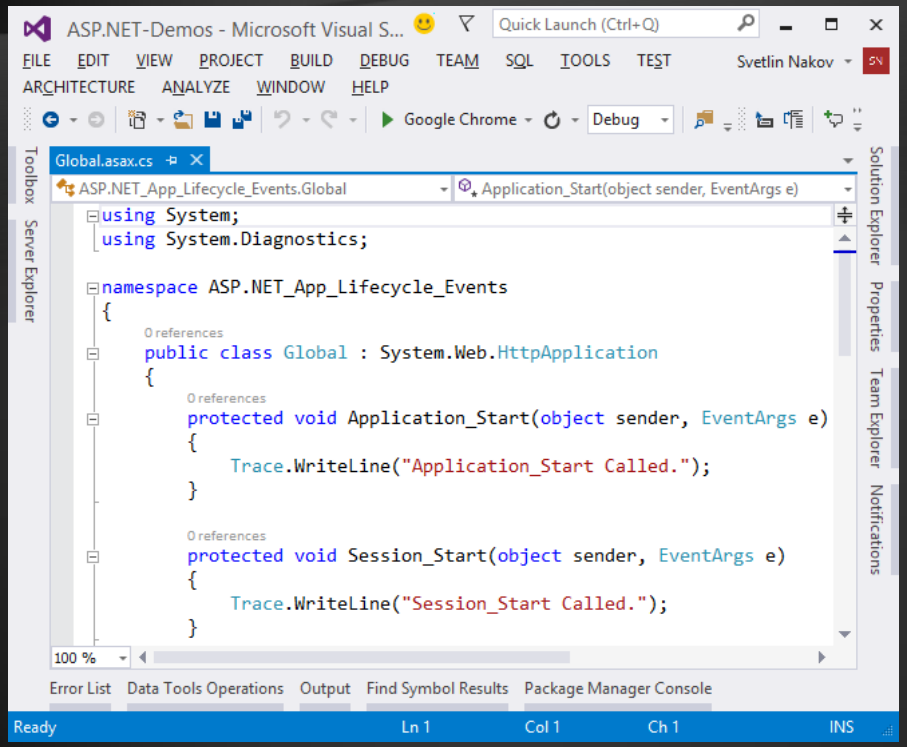

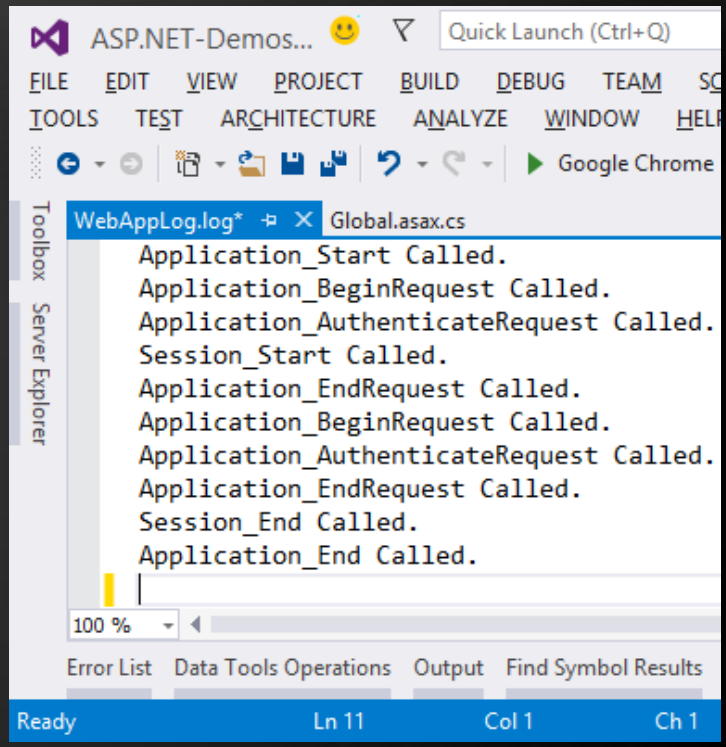

App Lifecycle Events

Live Demo

HTTP Handlers

- A "HTTP handler" is a process / C# code that responses to HTTP requests
- Sample HTTP handler in C#:

```
public class TelerikAcademyHttpHandler : IHttpHandler
{
  public void ProcessRequest(HttpContext context)
  { context.Response.Write("I am a HTTP handler."); }

  public bool IsReusable
  { get { return false; } }
}
```

- Handler registration in `Web.config`:

```
<configuration><system.webServer><handlers>
  <add verb="*" path="*.academy" name="Academy's HTTP handler"
       type="TelerikAcademyHttpHandler"/>
</handlers></system.webServer></configuration>
```

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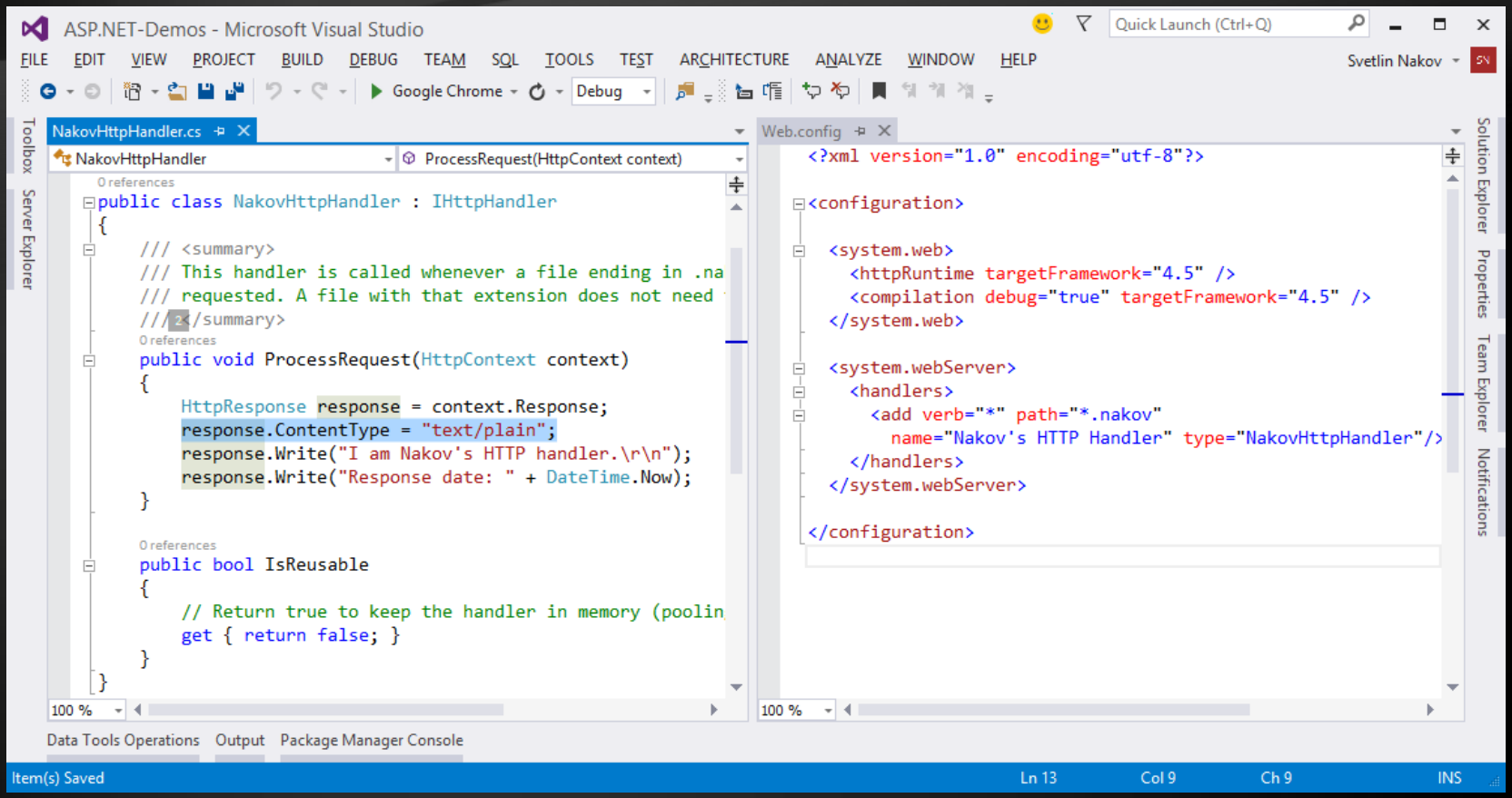

Writing a HTTP Handler

Live Demo

HTTP Modules

- HTTP modules can customize requests for resources that are serviced by ASP.NET
  - It can intercept all HTTP requests and apply a custom logic
- Steps to create an HTTP Module
  - Implement the `IHttpModule` interface
    - Subscribe to events you want to intercept, e.g. `HttpApplication.BeginRequest`
  - Register the HTTP module in `Web.config` in the `<modules>` section

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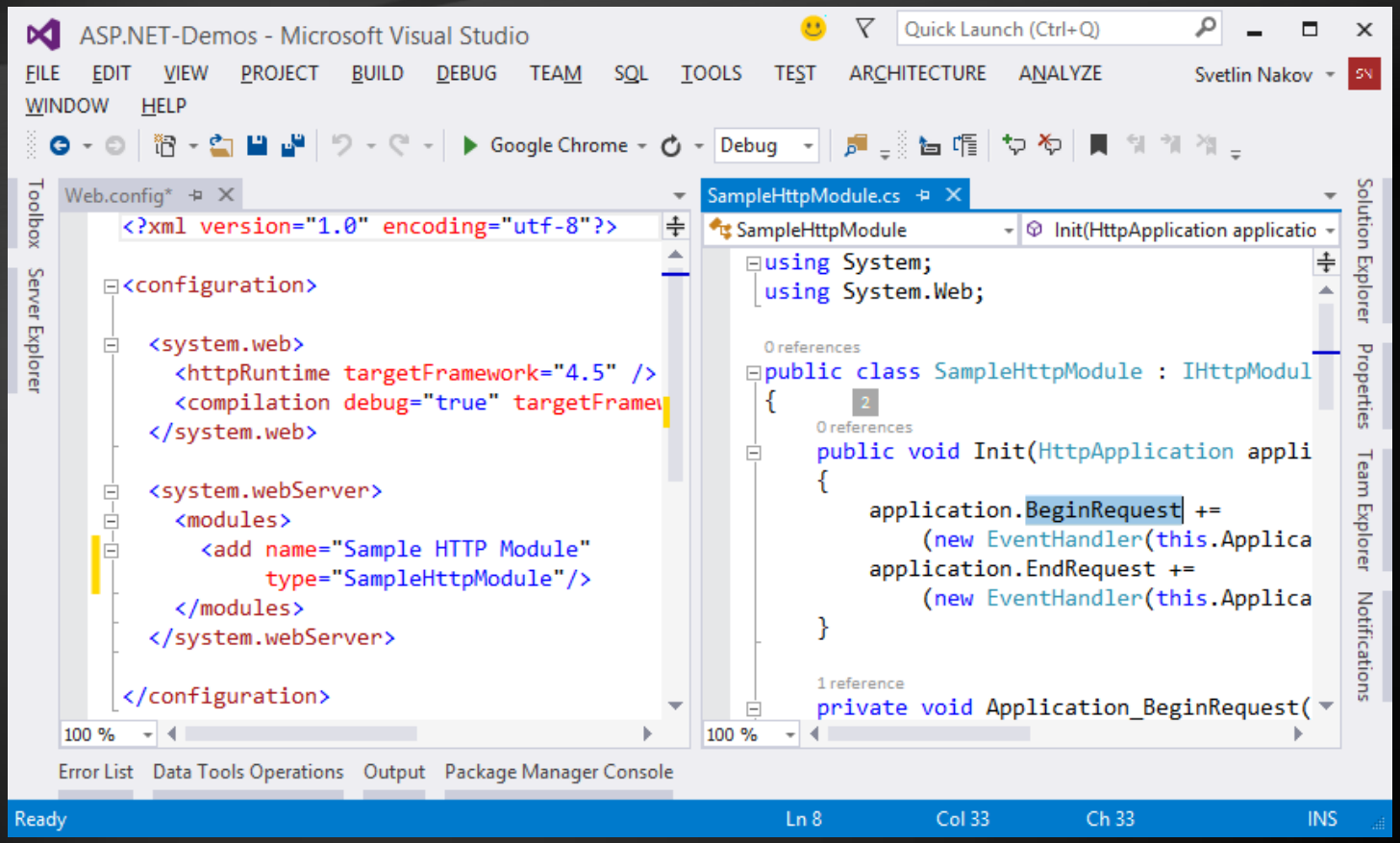

Writing a HTTP Module

Live Demo

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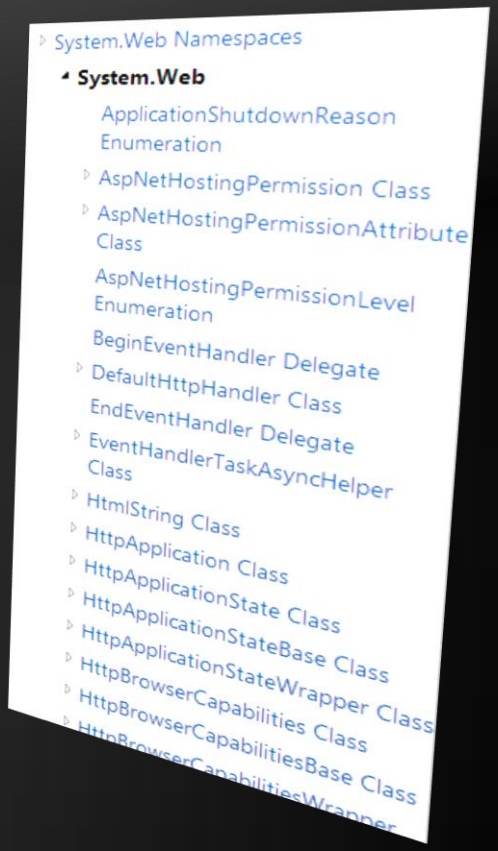

ASP.NET Common Concepts

Major Classes, Namespaces, Web Sites, Web Apps

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ASP.NET Namespaces

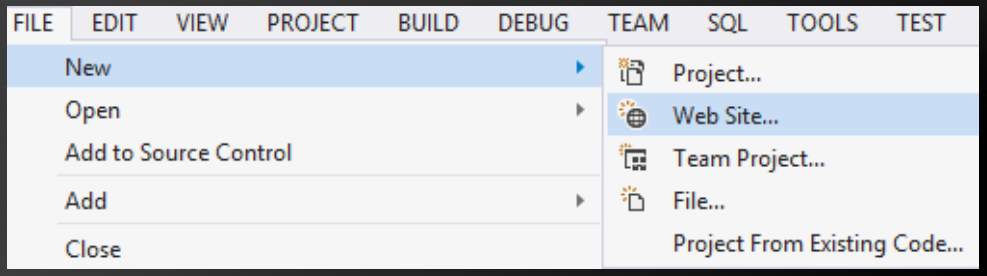
- Major ASP.NET (4.5) namespaces
  - `System.Web`
    - Web application main classes like `HttpApplication`, `HttpContext`, `HttpRequest`, `HttpResponse`, `HttpSessionState`, …
  - `System.Web.Mvc`
    - MVC classes and framework components
  - `System.Web.UI`
    - Web Forms UI controls (like `Button` and `Label`)

ASP.NET Classes

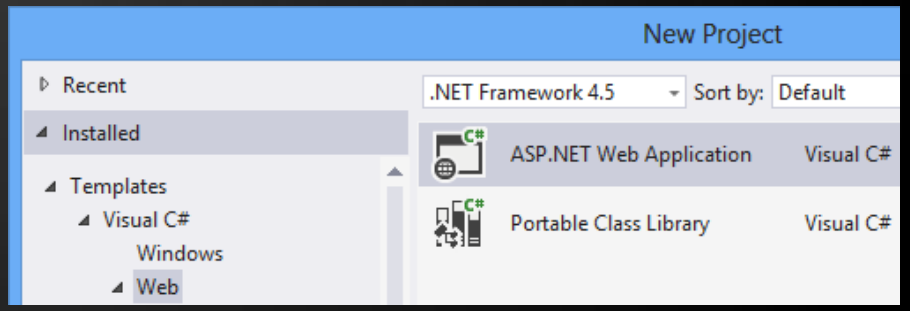
- `HttpApplication`
  - Base class for the ASP.NET Web apps (inherited in `Global.asax`)
- `HttpContext`
  - Encapsulates all HTTP-specific information about an individual HTTP request
- `HttpRequest`
  - Encapsulates an HTTP request
- `HttpResponse`
  - Encapsulates an HTTP response

Web Site vs. Web Application

- Web Sites in VS
  - No project file (`.csproj` / `.sln`)
  - Code compiled dynamically at the Web server
  - Can be precompiled (into multiple assemblies)



- Web Apps in VS
  - Have project file (like any C# project)
  - Compilation produces an assembly: `bin\*.dll`



- Web apps are recommended (read more)

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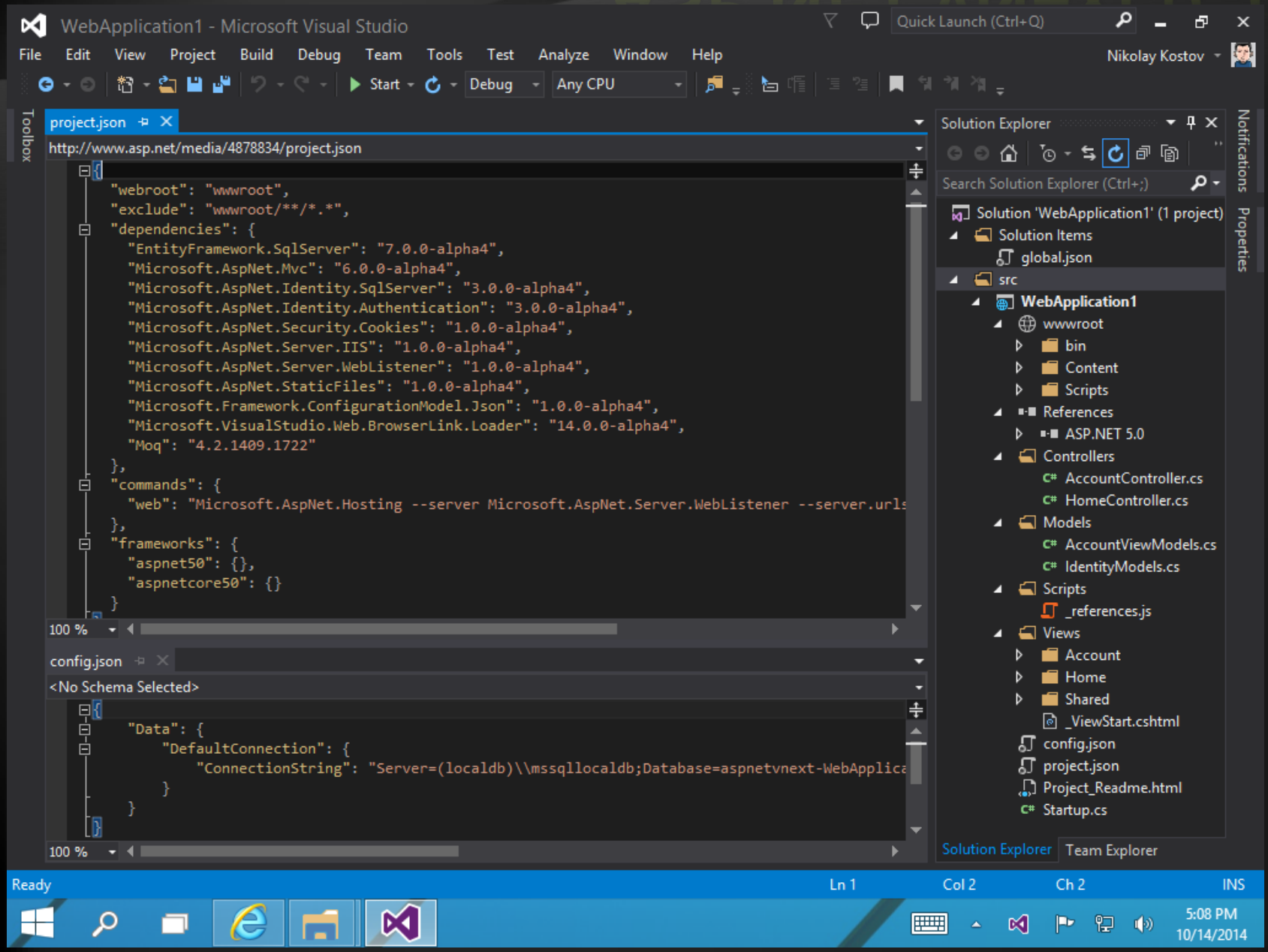
ASP.NET vNext (5.0)



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Exercises

1. Create and run few Web applications in Visual Studio to play with ASP.NET, compile and run them:
   - ASP.NET Web Forms application
   - ASP.NET MVC application
   - ASP.NET Web API application
   - ASP.NET Single Page application (SPA)
2. Write a simple application to sum numbers in ASP.NET Web Forms and ASP.NET MVC. Submit the code only (without the NuGet packages).
3. * Write an HTTP handler that accepts a text as HTTP GET or POST request and returns as a result the text as PNG image. Map it to process `*.img` requests.