

BUILD AN ASP.NET CORE AND EF CORE APP

HANDS ON LAB

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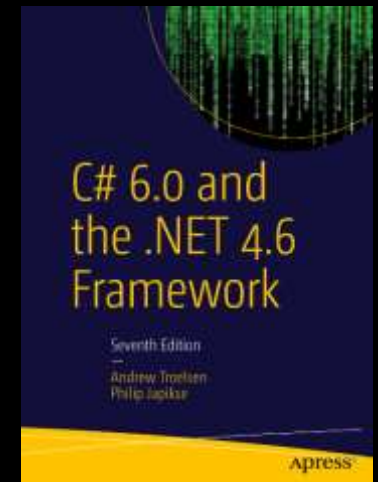
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Phil.About()

- Consultant, Coach, Author, Teacher
 - Lynda.com (<http://bit.ly/skimedicyndacourses>)
 - Apress.com (<http://bit.ly/apressbooks>)
- Microsoft MVP, ASPInsider, MCSD, MCDBA, CSM, CSP
- Founder, Agile Conferences, Inc.
 - <http://www.dayofagile.org>
- President, Cincinnati .NET User's Group



PREREQUISITES

- Visual Studio 2017 (any edition)
- SQL Server 2016 (any edition)
- Lab files from GitHub repo:
 - https://github.com/skimedic/dotnetcore_hol

INTRO TO .NET CORE

WHAT IS .NET CORE?

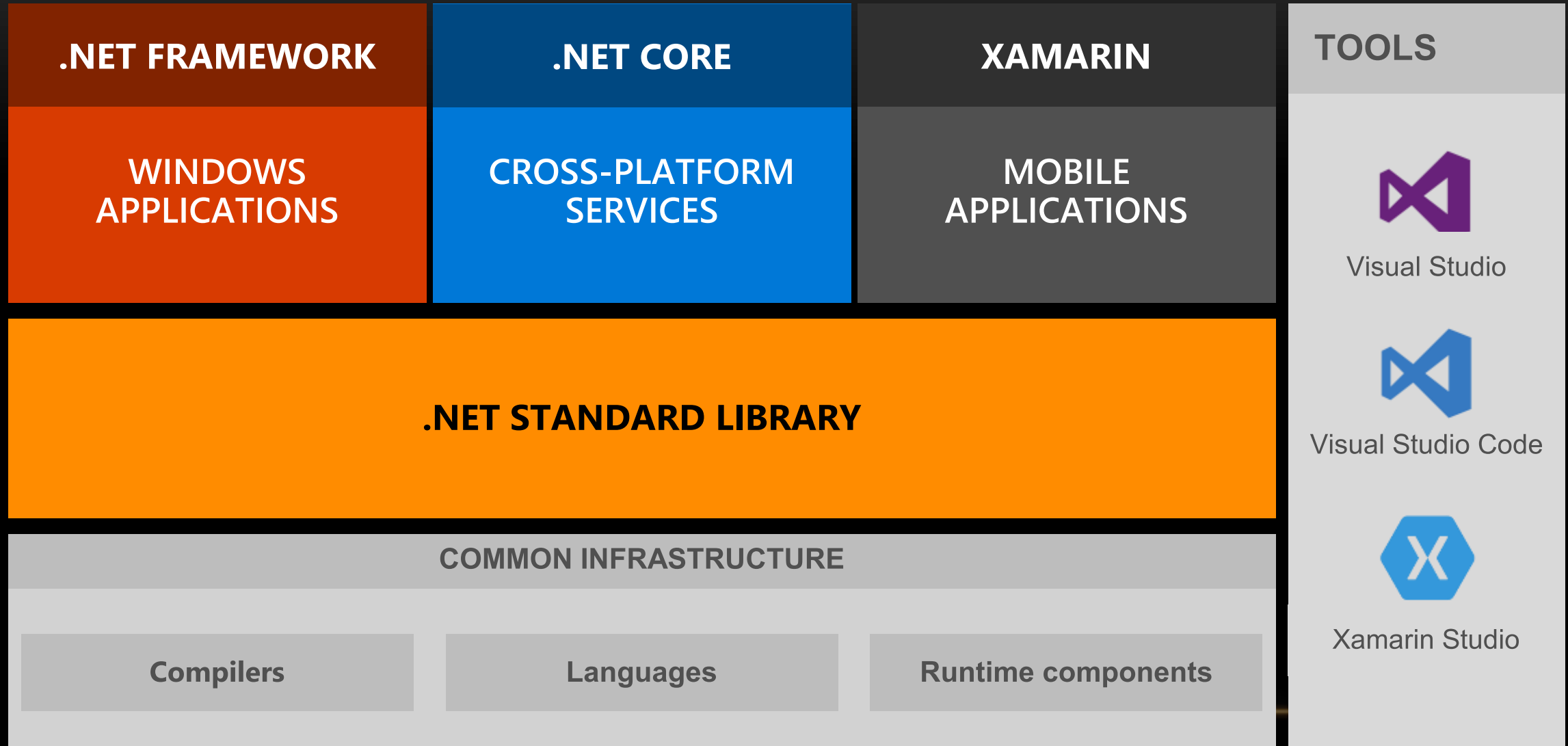
- Rewrite of “full” .NET Framework
- Vast performance improvements over prior versions
 - Including native compilation
- Flexible deployment model
 - Windows, Linux, Mac
- Full command line support
- True side by side installation support
- Open source from the start
 - Many improvements and features provided by the community



COMPOSABLE SYSTEM OF NUGET PACKAGES

- Runtime (CoreCLR) –
 - Garbage collection, JIT compiler, base .NET types, low level libraries
- Foundational Libraries (CoreFX) –
 - Collections, file systems, console, XML, async, etc.
- Command Line Interferace (CLI)
- Language Compilers
- Entity Framework Core
- ASP.NET Core

FULL BCD (BIRTHDAY CAKE DIAGRAM)



.NET CORE SUPPORT LIFECYCLES

➤ Long Term Support (LTS)

- Major releases (e.g. 1.0, 2.0)
- Only upgraded with critical fixes (patches)
- Supported for three years after GA release or at least one year after the next LTS release.

➤ Current

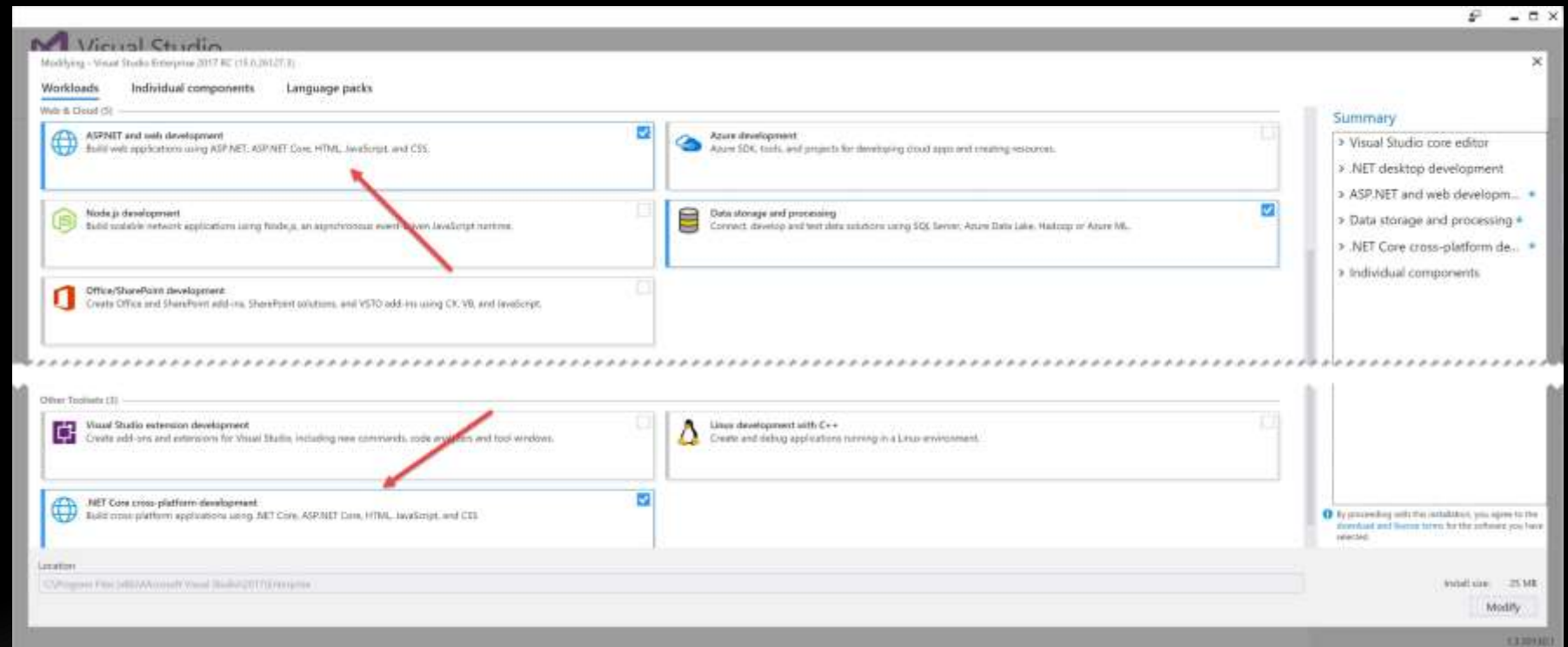
- Minor releases (e.g. 1.1, 1.2)
- Upgraded more rapidly
- Supported for three months after next Current release

<https://www.microsoft.com/net/core/support>

INSTALLING VS2017 AND .NET CORE

INSTALL VISUAL STUDIO 2017

- Installation process is divided into Workloads
- Select “ASP.NET and web development” and “.NET Core cross-platform development”



CONFIRM THE INSTALL OF .NET CORE SDK

- Open Command Prompt
 - “where dotnet” => Installations for .NET Core
- Results for the following depend on the path
 - “dotnet” => Shared Framework Host (1.1.0)
 - “dotnet --info” => .NET Core CLI Info (1.0.3)
 - “dotnet --version” => .NET Core CLI Version Number (1.0.3)
 - “dotnet –help” => Lists base CLI commands available

CHANGE THE .NET CORE VERSION FOR A PROJECT

➤ Create a global.json file at the root

```
{  
  "project" : ["src","test"],  
  "sdk" : {  
    "version" : "1.0.4"  
  }  
}
```

DEMO DEWNO

Lab 0: Installing Prereqs

.NET CORE APPLICATIONS ADDING/UPDATING PACKAGES

ANATOMY OF A .NET CORE APPLICATION

- Console Apps and Class libraries are same as under full .NET F/W
- ASP.NET Core apps are simply console applications
 - Create a Web Server on application entry point (Kestrel or IIS)
 - Kestrel – built in web server based on libuv

ANATOMY OF A .NET CORE APPLICATION

- Deployment models
 - Self contained – contains everything needed to run, including .NET Core
 - Standard – expects .NET Core installed on deployment machine
- Can execute all with “dotnet run”

PROJECT CONSIDERATIONS

➤ MVC:

- Select 'ASP.NET Core Web Application (.NET Core)'
- Choose 'ASP.NET Core 1.1' Templates
- Select 'Web Application'

➤ Data Access Library

- Pick 'Console App (.NET Core)'
- EF Core migrations require an entry point*

➤ Models

- Pick 'Class Library (.NET Core)'

ADDING/UPDATING NUGET PACKAGES

- NuGet Packages update faster than VS2017 Templates
- Add/Update/Remove packages using:
 - .NET Core Command Line Interface
 - Package Manager Console
 - NuGet Package Manager GUI

RUNNING ASP.NET CORE APPLICATIONS

- Visual Studio
 - Select IIS or Kestrel
 - Port is controlled by launchSetting.json
- .NET Core CLI
 - 'dotnet run'
 - Port defaults to 5000
 - Can be changed using WebHostBuilder

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Lab 1:

Creating the Projects

Adding/Updating the NuGet packages

ENTITY FRAMEWORK CORE

EF PROJECT STATUS

WHAT IS ENTITY FRAMEWORK CORE 1

- Newest version of Entity Framework - complete re-write from EF 6.x
- Lightweight, Modularized
- Cross Platform (built on .NET Core)
- Based on an 'Opt-in' model – only load needed packages

- Just released as RTM (1.1.1)
 - Still some missing features from EF 6.x
 - Check http://bit.ly/ef6_efcore to see the current status

(SOME) MISSING* FEATURES IN CURRENT VERSION OF EF CORE 1

- EDMX Designer
 - Not coming back!
- Alternate inheritance mapping patterns
 - Implemented: Table Per Hierarchy (TPH)
 - Missing: Table Per Type (TPT), Table Per Concrete Type (TPC)
- Complex/Value types
- Spatial Data Types
- Lazy loading
- Command Interception
- Stored Procedure Mapping
- Data Initializers
- Some Data Annotations

http://bit.ly/ef6_efcore

EF CORE GOODNESS

DBCONTEXT

- EF Core DbContext changed since EF 6.x
 - Fully embraces dependency injection
- OnConfiguring provides fall back mechanism
- Full support for FluentAPI in OnModelCreating

PERFORMANCE IMPROVEMENTS (NEW)

- EF Core batches multiple insert, update, delete statements into a single call
 - Uses table valued parameters to process changes in a single network call
 - Improved performance through reduced network traffic
 - Reduces cost for cloud based databases
- Batch size can be configured through the DbContextOptions

CONCURRENCY CHECKING (CARRY OVER)

- SQL Server uses Timestamp (rowversion) properties
 - Coded as a byte[] in C#
- Updates and Deletes are modified
 - Where <pk> = @p1 and <timestamp> = @p2
- Error throws DbUpdateConcurrencyException
 - Provides access to entities not updated/deleted
 - EF Core 1.1 added back familiar API calls
- Developer decides how to handle concurrency errors

EF CORE MIGRATIONS (IMPROVED)

- Used to modify schema of based on model and SQL Code
 - Can also scaffold existing database into Context and Models
- Supports more than one DbContext in a project
 - E.g. ApplicationDbContext (ASP.NET Identity) and MyDomainModelContext
- Can also create SQL script representing changes to the database
- Note: Migrations only work with projects that emit entry point

CHANGES FROM EF6 MIGRATIONS

➤ The Good

- No longer uses a hash to check database state
- ModelSnapshot is C# file that contains all of the DDL
- Database.Migrate method creates model AND runs all migrations

➤ The bad?

- Database Initializers and Configuration Seed method are gone

DBSET<T> FIND METHOD (RE-INTRODUCED IN 1.1)

- Introduced in EF Core 1.1
 - Largely due to the developer community
- Searches on primary key(s)
 - Returns instance from DbChangeTracker is currently tracked
 - Else calls to database

USING COMPUTED COLUMNS IN MODELS (FIXED IN 1.1)

- Same table computed columns supported with EF Core 1.0

```
entity.Property(e => e.LineItemTotal).HasColumnType("money")  
    .HasComputedColumnSql("[Quantity]*[UnitCost]");
```

- UDF based computed columns supported with EF Core 1.1

```
entity.Property(e => e.OrderTotal).HasColumnType("money")  
    .HasComputedColumnSql("Store.GetOrderTotal([id])");
```


FIELD MAPPING/BACKING FIELDS (NEW)

- Allows EF to read and/or write to fields instead of properties
- Conventions
 - [m]_<camel-cased property name>
 - [m]_<property name>
- Fluent API
 - `modelBuilder.Entity<Blog>().Property(b=>b.Url).HasField("_theUrl")`
- Used when materializing objects
 - Public getters/setters (if they exist) used at other times
- Can control when the fields are used
 - Field
 - FieldDuringConstruction
 - Property

CONNECTION RESILIENCY (RE-INTRODUCED IN 1.1)

- Built in retry mechanism defined by relational database providers
 - Default – no retry
 - `SqlServerRetryingExecutionStrategy`
 - Optimized for SQL Server and SQL Azure
- Custom Execution Strategy
 - Specify retry count and max delay
- Throws `RetryLimitExceededException`
 - Actual exception is inner exception

EF CORE SUPPORTS MIXED EVALUATION (NEW)

- EF Core supports queries being evaluated on the server and the client
 - What executes where is provider specific
- Useful for including C# functions into the LINQ query/project
- Be careful where the client functions are injected
 - Poor usage can crush performance
- Enabled or disabled at the context level

```
optionsBuilder.UseSqlServer(connectionString)
    .ConfigureWarnings(warnings =>
        warnings.Throw(RelationalEventId.QueryClientEvaluationWarning));
```

POPULATING MODELS WITH RAW SQL QUERIES (NEW)

- Models can be populated from raw SQL using FromSql on DbSet<T>
 - Select list names must match the names that properties are mapped to
 - All fields on the model must be returned
- Useful for times when Sprocs or UDFs perform better than LINQ/EF
- Can also populate POCOs that are not tables
 - Must be in the Context as a DbSet<T>
 - Must have a primary key defined
- Can be mixed with LINQ statements

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Lab 2 Part 1:

Create the Models and ViewModels

Create the DbContext, Migrations

Add Calculated Column to Model (based on UDF)

FINISHING THE DATA ACCESS LAYER

CREATE THE REPOSITORIES

- DbContext is technically a combination of two patterns:
 - Unit of Work
 - Repository
- Adding Custom Repositories eliminates repetitive code
 - Create `IRepo<T>` and `BaseRepo<T>` to handle most scenarios
- Specific Repos (e.g. `ProductsRepo`) handle special cases

DATA INITIALIZATION

- Largely a manual process - Drop/Create base classes from EF 6.x don't exist
- EnsureDeleted - Drops database
- EnsureCreated - Creates database *based on model*
- Migrate()
 - Creates database and runs all migrations as well
 - Usually placed in ctor for DbContext classes
- No way to set initializer – must call from code (Startup.cs?)

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Lab 2 Part 2:

Create the Repositories

Create the Data Initializer

TESTING EF CORE

XUNIT TEST FRAMEWORK

- Excellent .NET testing framework
- Built by the creators of NUnit
- Supports full .NET F/W, .NET Core, and Xamarin
 - Project templates are “in the box”
- Supports multitude of test runners
 - VS2017, R#, TestDriven.NET, TeamCity, MSBuild

XUNIT FUNDAMENTALS

- Fact = Test
- Theory = RowTest
- SetUp and TearDown removed in favor of constructors and IDisposable
- ExpectedException removed (Finally!)
- Full Generics support
- Use of anonymous delegates in Assert.Throws

```
Assert.Throws<ExceptionType>(()=>operation());
```

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Lab 3:

Testing EF Core

ASP.NET CORE FUNDAMENTALS

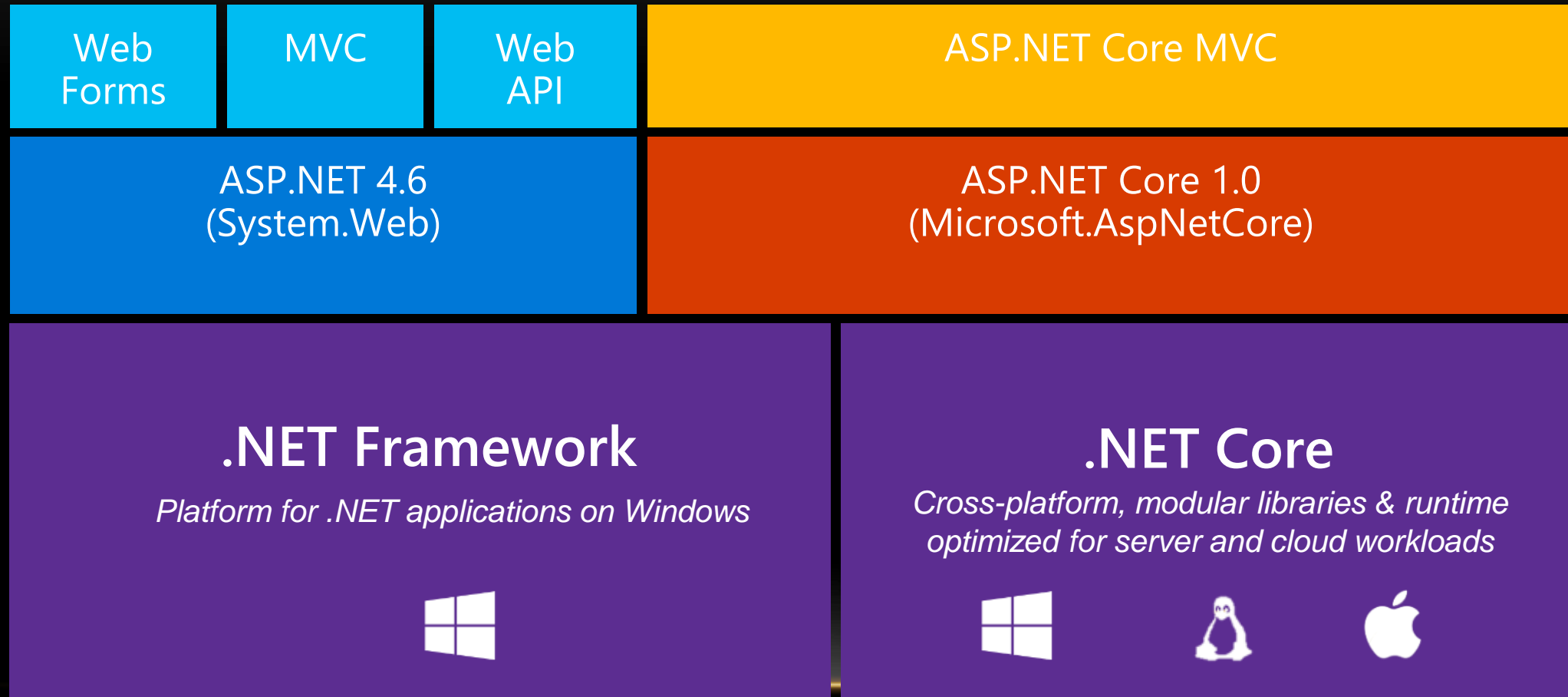
ASP.NET CORE

- ASP.NET Core builds on top of .NET Core
- Single, cross-platform framework for web, services, and microservices
- Fully integrates with CLI tooling and the shared framework
- Takes advantage of .NET Core performance and includes a high performance web server (Kestrel) built on LibUV
- One Framework – WebApi + MVC + Web Pages = ASP.NET Core
- Runs on IIS or Self-Hosted

ASP.NET CORE FEATURES

- Pluggable Middleware enabling you to inject as little or much functionality as needed
 - Routing, authentication, static files, diagnostics, error handling, session, CORS, localization, custom
- Deep integration with Dependency Injection
- Simplified Configuration System
- ***NEW*** Tag Helpers
- ***NEW*** View Components
- Much improved separation of code and content

ASP.NET CORE IN A NUTSHELL



GETTING STARTED WITH ASP.NET CORE

BUILDING THE WEB HOST

- Web Host is configured in the application entry point
- Starts with no services
 - Add in the needed options (typically IIS and Kestrel)
- Defines content root (defaults to wwwroot)
- Defines startup class used to configure the application

STARTUP.CS

- Defined using the WebHostBuilder
- Configures the application through appsettings.json
- Configures services used by the application
 - Populates the Dependency Injection Container
- Configures the HTTP Pipeline

THE STARTUP CLASS

- Constructor loads the application configuration
- Configures the HTTP Pipeline
- Creates services such as MVC, EF, and/or Identity
- Configures the Dependency Injection container

DEPENDENCY INJECTION

- Key component of ASP.NET Core
 - IServiceProvider is built in DI container
 - All aspects of ASP.NET Core can leverage the DI container
- Registering custom interfaces
 - Transient – instantiated separately for every object that needs it
 - Scoped – instantiated once per request
 - Singleton – doesn't need to implement singleton pattern

ADDING CUSTOM SERVICES TO DI CONTAINER

- Any custom service can be added to the DI container
- Built in DI container uses constructor injection
 - Only uses public constructors
 - Must only have one applicable constructor
 - Any additional parameters must have default values
- Services should implement IDisposable
 - Any services created by the container will be automatically disposed

ENVIRONMENTS

- ASP.NET Core references the `ASPNETCORE_ENVIRONMENT` variable to determine runtime environment
 - Default options are Development, Staging, and Production
 - Custom values are also available
- Greatly simplifies deploying down the operational chain
- Environment can be referenced in code and markup (through tag helpers)

CONFIGURATION

- ASP.NET Core greatly simplifies application configuration
 - Default configuration files are simple JSON files
 - Additional options include command line arguments, in-memory .NET objects, and custom providers
- IConfigurationRoot created by the ConfigurationBuilder class populates the configuration values
 - Typically done in the constructor of the Startup class and added to the DI container
- Can leverages the environment settings

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Lab 4:

Creating the WebHost

Configuring the application

Adding connection strings to the settings files

CUSTOM VALIDATION

VALIDATION

- Nothing new for standard model validation
 - Validation and Display attributes
 - Model State
 - Explicit and Implicit validation
- Creating custom validation attributes changed slightly
 - Server side code derives from `ValidationAttribute`
 - Must also implement `IClientModelValidator` to support client side scripts
 - Client side validation ties into JQuery validations

SERVER SIDE VALIDATION

- Override ValidationResult IsValid method
 - ValidationContext provides access to metadata and the rest of the model
 - Return ValidationResult.Success or ValidationResult(errorMessage)
- Should also override FormatErrorMessage

CLIENT SIDE VALIDATION

- Must implement AddValidation method in custom attribute
 - Adds the data-val attributes to the rendered element only if using razor editor templates
- JavaScript code needs to:
 - Add validator method – must match data-val name
 - Add unobtrusive validation adapter
 - Must match data-val name
 - Rules must be set to enable validation
- JQuery.Unobtrusive-ajax.js must be referenced on the page

BUNDLING AND MINIFICATION

BUNDLING AND MINIFICATION

- JavaScript and CSS files should be bundled and minified for performance
- VS 2017 uses BundlerMinifier NuGet package by default
- Settings defined in by bundleconfig.json
 - Specify: outputfilename, inputfiles (globbing allowed), optional parameters
- Add:
 - BundlerMinifier Visual Studio Extension for IDE integration
 - BundlerMinifier.Core for .NET Core CLI

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Lab 5:

Custom server and client side validation

Bundling and Minification

VIEW COMPONENTS

VIEW COMPONENTS

- Combine partial views with server side capabilities
- Server side class implements ViewComponent
- Partial view must be located in:
 - Views/<controller_name>/Components/<view_component_name>/<view_name>
 - Views/Shared/Components/<view_component_name>/<view_name>
- Don't use model binding
- Can be invoked as a Tag Helper (with ASP.NET Core 1.1)

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Lab 6:

View Components

VIEW MODELS AND CONTROLLERS

CONTROLLERS

- Everything derives from Controller base class
 - Base class provides many helpers, such as:
 - Ok (200), BadRequest (400), NotFound (404)
- Actions return an IActionResult/Task<IActionResult>
- Dependencies are injected into the controllers
- Attribute Routing is now a first class citizen in ASP.NET Core
 - Helps to refine routing for individual controller actions
- In this example app, base controller OnActionExecuting override is used to create fake authentication

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Lab 7:

View Models and Controllers

TAG HELPERS AND VIEWS

TAG HELPERS

- Encapsulate server side code to shape the attached element
 - Keep developers “in the HTML”
- Most Razor HTML Helpers have corresponding Tag Helpers
 - Form, Anchor, Input, TextArea, Select, Validation, Link/Script, Image
 - Added as attributes with asp-
- Special: Environment Tag Helper
- Custom Tag Helpers can be created

TAG HELPER DETAILS

➤ Form

- Similar to BeginForm/EndForm HTML Helper
- Automatically generates the anti-forgery token
- asp-controller, asp-action, asp-method, asp-route-<parameter name>
- Can use named routes: asp-route="routename"

➤ Anchor

- Similar to ActionLink HTML Helper
- asp-controller, asp-action, asp-route-<parameter name>

TAG HELPER DETAILS (CONTINUED)

➤ Input

- Model property is selected with asp-for (strongly typed)
- Generates id and name properties for each element
- Renders markup based on data type of the model property
- Adds in HTML type based on model type and data annotations
- Generates HTML5 validation attributes

➤ TextArea

- Model property is selected with asp-for (strongly typed)
- Generates id and name properties for each element

TAG HELPER DETAILS (CONTINUED)

➤ Select

- Generates id and name properties for each element
- Generates select and options using asp-for and asp-items

➤ Validation

- Model validation uses asp-validation-summary (in a div)
 - Options are All, ModelOnly, None
- Property validation uses asp-validation-for (in a span)

➤ Link, Image

- Can append (asp-append-version="true") hash of the file to the URL to prevent caching issues

TAG HELPER DETAILS (CONTINUED)

➤ Script

- Provide fallback for scripts (such as CDN sources)
 - Fallback source – asp-fallback-src
 - Test for fallback – asp-fallback-test

➤ Environment

- Tag helper to define markup block based on configuration environment
<environment names="Staging,Production">

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Lab 8: Views

CUSTOM TAG HELPERS

CUSTOM TAG HELPERS

- Composed entirely of server side code
- Class inherits TagHelper
- Class name (minus TagHelper) becomes the element name
 - E.g. EmailTagHelper == <email></email>
- Public properties are added as lower kebob cased attributes
 - E.g. EmailName == email-name=""
- Must opt in to use (usually in the _ViewImports.cshtml partial)
 - @addTagHelper *, SpyStore_HOL.MVC

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Lab 9:

Custom Tag Helpers

Contact Me

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Thank You!