Rainer Stropek | time cockpit

C#-Revolution

Your Host

Rainer Stropek

- Developer, Entrepreneur
- MVP for Azure, MVP for Dev Technologies, MS Regional Director, Trainer at IT-Visions

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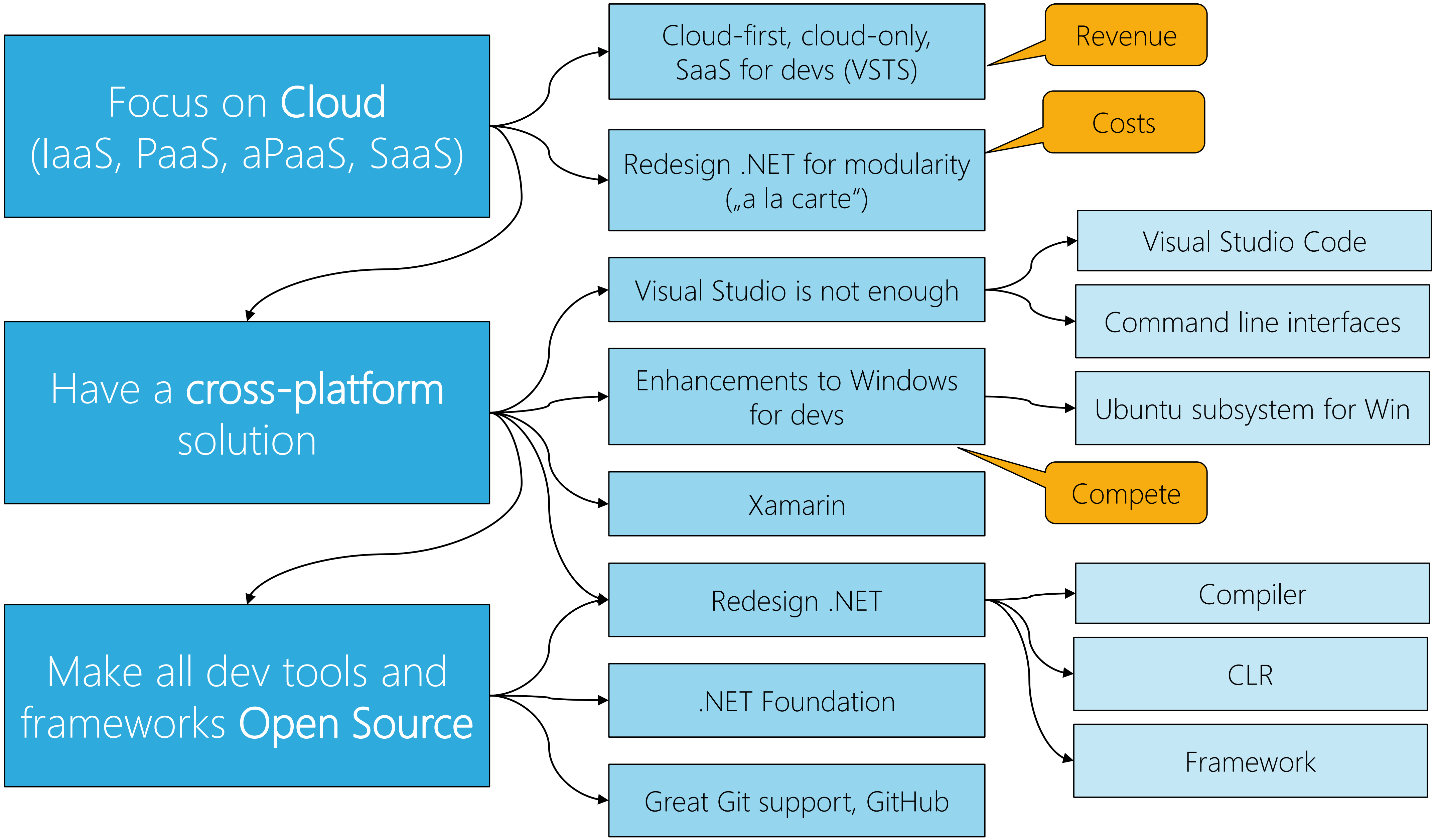
Agenda

C# und .NET machen einen radikalen Wandel durch. Open Source, Plattformunabhängigkeit, grundlegendes Redesign, neue Compilerplattform – als C#-Entwicklerinnen und -Entwickler gibt es viel Neues zu lernen. Der BASTA!-C#-Workshop von Rainer Stropek ist eine gute Gelegenheit, sich einen Tag Zeit zu nehmen, um auf den neuesten Stand zu kommen. Im Workshop werden unter anderem folgende Themen behandelt:

- Neuerungen in C# und Visual Studio
- Die neue .NET Runtime
- dotnet CLI
- Die neue .NET-Ausführungsumgebung
- Anwendungsbeispiele in ASP.NET Core (Fokus liegt auf der Sprache und .NET-Grundlagen, nicht auf ASP.NET)
- Neue Tools und Libraries.

In der bewährten Art und Weise wird sich Rainer Stropek im Workshop auf Codebeispiele statt Slides konzentrieren.


Focus on Cloud (IaaS, PaaS, aPaaS, SaaS)
Cloud-first, cloud-only, SaaS for devs (VSTS)
Revenue
Redesign .NET for modularity („a la carte“)
Costs
Have a cross-platform solution
Visual Studio is not enough
Visual Studio Code
Command line interfaces
Enhancements to Windows for devs
Ubuntu subsystem for Win
Compete
Xamarin
Make all dev tools and frameworks Open Source
Redesign .NET
Compiler
CLR
Framework
.NET Foundation
Great Git support, GitHub

.NET Core

Why .NET Core?

Refactor .NET Framework

- Establish a Standard Library for the various incarnations of .NET
- .NET Core is not 100% compatible with .NET 4.x (details)

Make it a real cross-platform solution

- Windows, Mac OS, Linux (details in .NET Core Roadmap)

Make it open source

- A .NET Foundation project
- MIT License

Details: https://docs.microsoft.com/dotnet/

Components of .NET Core

.NET Runtime (CoreCLR)

- CoreCLR includes Base Class Library (BCL)

.NET Core Foundation Libraries (CoreFX)

.NET Command Line Tools (.NET CLI)

- Including the **`dotnet`** application host

Cross-Platform Compiler (Roslyn)

Status of .NET Core

.NET Core 2.0 is RTM (Aug. 2017)
- Download current version
- 2.1 is scheduled for Spring 2018 (roadmap)

Visual Studio Tools are RTM
- Visual Studio 2017

C# is RTM

X64 Support
- X86, X64 support on Windows
- X64 support on many Linux distros
- Community-supported version for Raspberry Pi

See also: https://github.com/dotnet/core/blob/master/roadmap.md

What can you build?

Console applications

ASP.NET Core applications

UWP applications

Xamarin Forms applications

See also: https://github.com/dotnet/core/blob/master/roadmap.md

Where to get .NET Core?

.NET Core landing page

- With Visual Studio tools (Visual Studio prerequisites)
- Command-line tools (with your own editor, e.g. VSCode, download)

.NET Install Script (details, download)

- You have to care for the prerequisites

NuGet

- Packages and Metapackages

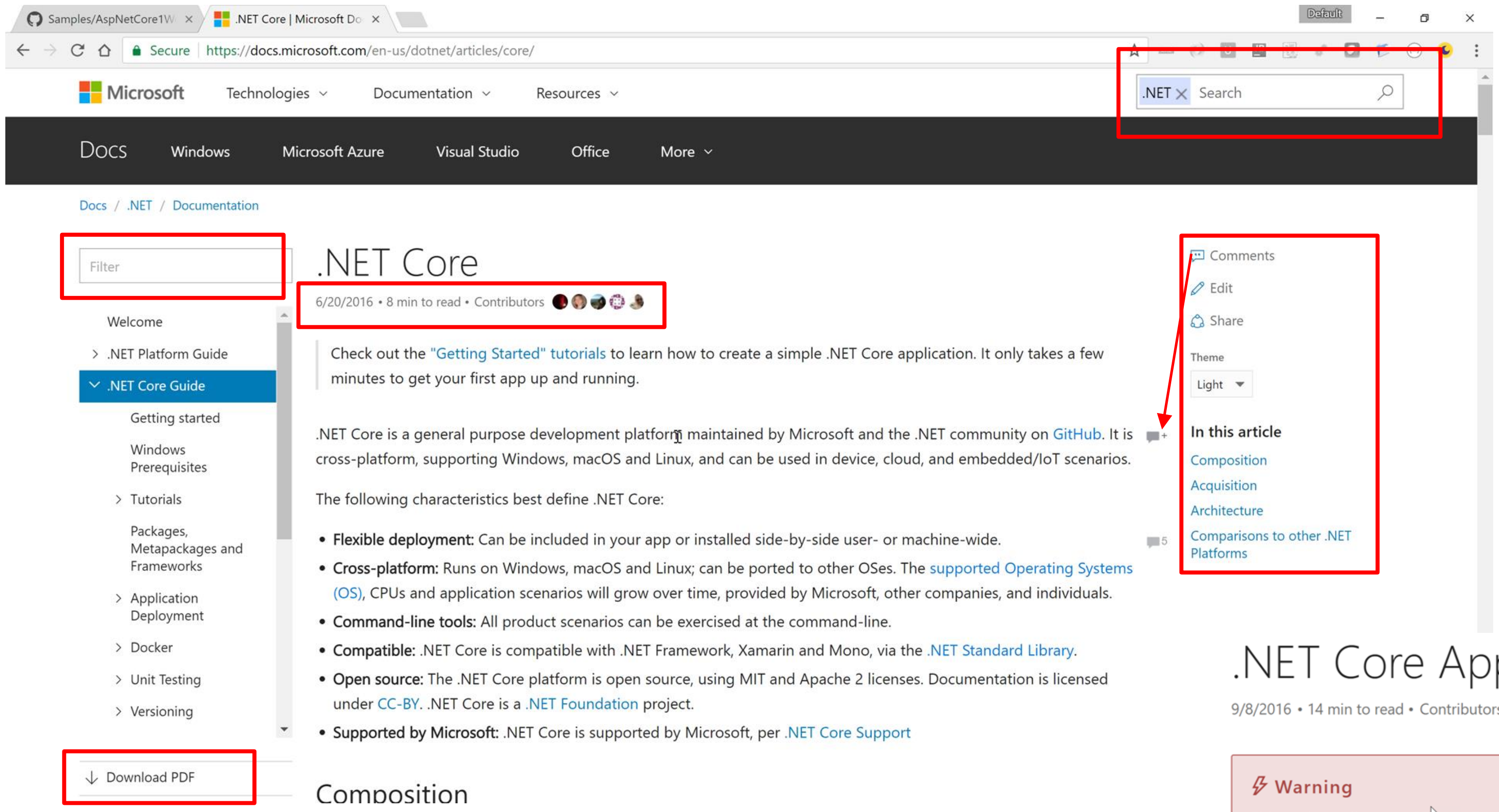
Docker: `microsoft/dotnet` image (details)

.NET Core Source Browser

See also: https://github.com/dotnet/core/blob/master/roadmap.md

Getting Help

New https://docs.microsoft.com



Samples/AspNetCore1W | .NET Core | Microsoft Do

Secure | https://docs.microsoft.com/en-us/dotnet/articles/core/

Docs / .NET / Documentation

.NET Core

6/20/2016 • 8 min to read • Contributors

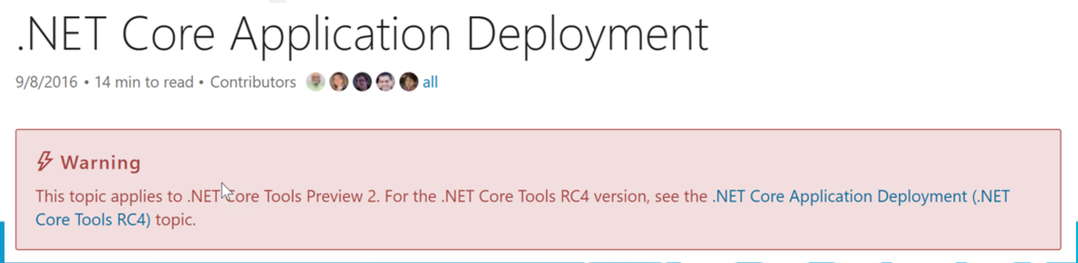
Check out the "Getting Started" tutorials to learn how to create a simple .NET Core application. It only takes a few minutes to get your first app up and running.

.NET Core is a general purpose development platform maintained by Microsoft and the .NET community on GitHub. It is cross-platform, supporting Windows, macOS and Linux, and can be used in device, cloud, and embedded/IoT scenarios.

The following characteristics best define .NET Core:

- **Flexible deployment:** Can be included in your app or installed side-by-side user- or machine-wide.
- **Cross-platform:** Runs on Windows, macOS and Linux; can be ported to other OSes. The supported Operating Systems (OS), CPUs and application scenarios will grow over time, provided by Microsoft, other companies, and individuals.
- **Command-line tools:** All product scenarios can be exercised at the command-line.
- **Compatible:** .NET Core is compatible with .NET Framework, Xamarin and Mono, via the .NET Standard Library.
- **Open source:** The .NET Core platform is open source, using MIT and Apache 2 licenses. Documentation is licensed under CC-BY. .NET Core is a .NET Foundation project.
- **Supported by Microsoft:** .NET Core is supported by Microsoft, per .NET Core Support

Composition



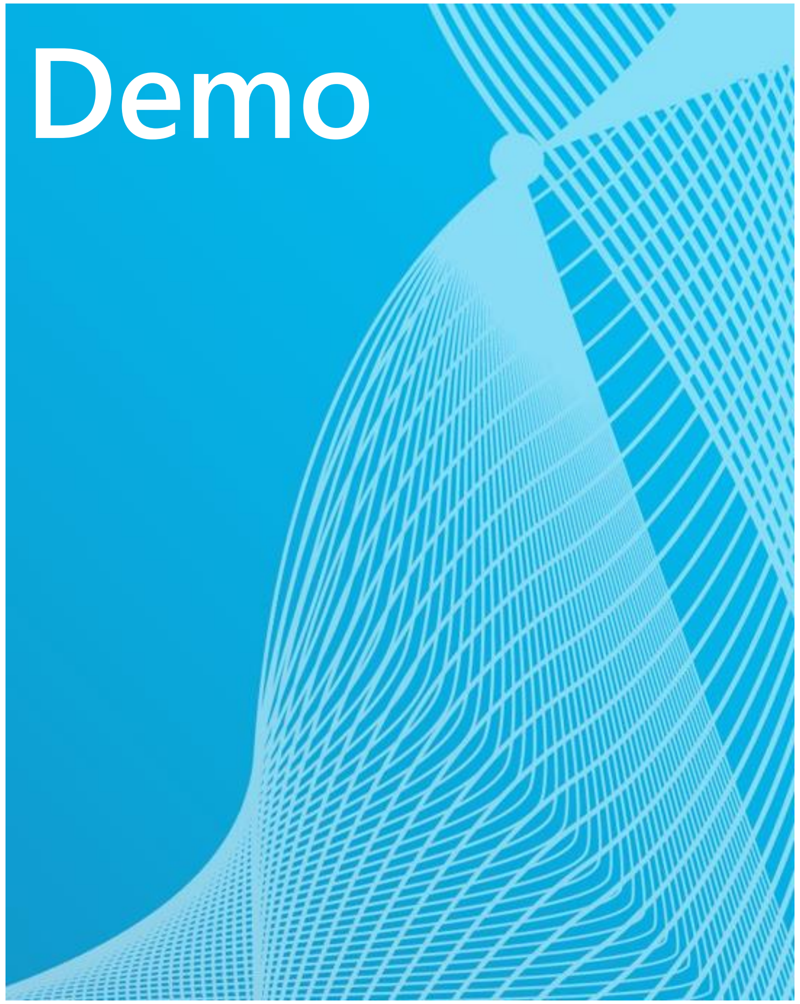
.NET Core Application Deployment

9/8/2016 • 14 min to read • Contributors all

Warning

This topic applies to .NET Core Tools Preview 2. For the .NET Core Tools RC4 version, see the .NET Core Application Deployment (.NET Core Tools RC4) topic.

Packages, Metapackages and Frameworks



Create console app with CLI

Analyze `.csproj`

Discuss `.csproj` reference

Run app

Publish app

Further readings

- [More about cross-platform libraries]
- [MSBuild Project File Schema Reference]
- [Creating new templates]
- [Runtime Configuration Files]

https://github.com/rstropek/Samples/tree/master/AspNetCore1Workshop/10-console-hello-world

.csproj

```
<Project Sdk="Microsoft.NET.Sdk">
  <PropertyGroup>
    <OutputType>Exe</OutputType>
    <TargetFramework>netcoreapp2.0</TargetFramework>
  </PropertyGroup>
</Project>
```

For executable, not present for class libraries

Target Framework

```
<Project Sdk="Microsoft.NET.Sdk">
  <PropertyGroup>
    <TargetFramework>netstandard2.0</TargetFramework>
  </PropertyGroup>
</Project>
```

Class library based on .NET Standard 2.0

See also MSBuild Project File Schema Reference

Solutions

Demo

Create solution: `dotnet new sln`

Add proj.: `dotnet sln add …`

Create solution in VS2017

- .NET Standard class library with Json.NET
- .NET Framework console app with reference

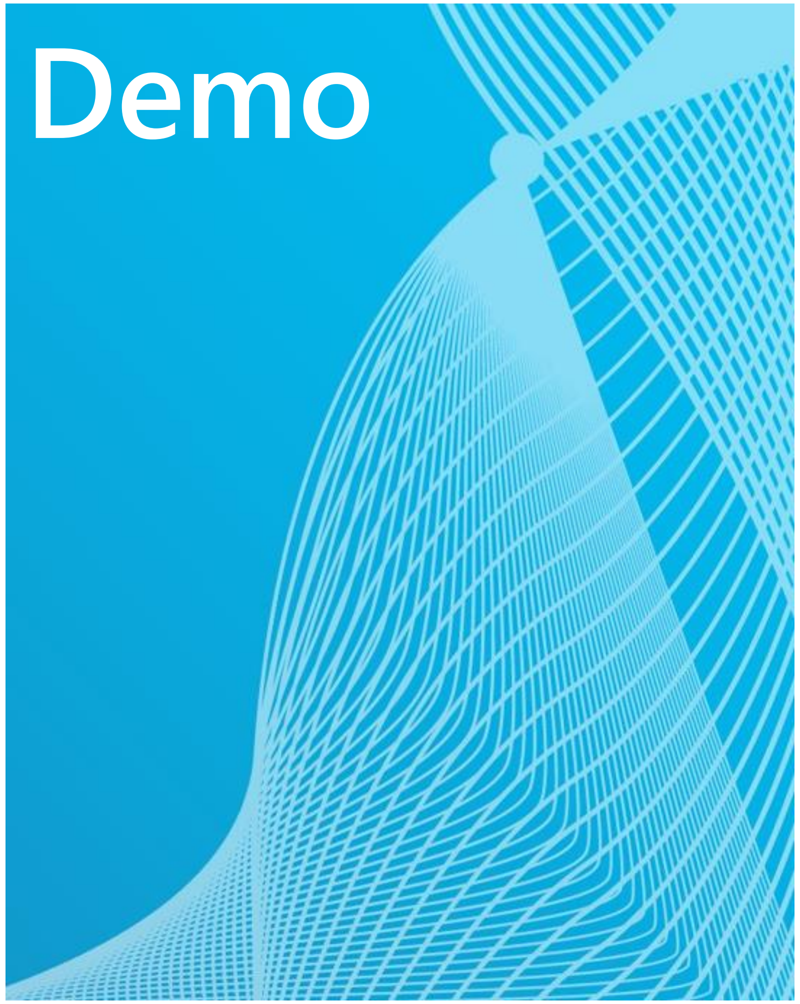
Further readings

- .NET Core Tools MSBuild

https://github.com/rstropek/Samples/tree/master/AspNetCore1Workshop/25-project-references

BASTA!

Cross-platform



Run app on Linux using Docker

`microsoft/dotnet` images

Multi-step build

Docker support in VS2017

See also https://github.com/dotnet/dotnet-docker-samples

.NET CLI

.NET Core CLI

`dotnet` command

- `new` – create project
- `migrate` –*project.json → .csproj*
- `restore` – restore dependencies
- `run` – run source code without explicit compile
- `build` – builds project and dependencies
- `test` – runs unit tests
- `pack` – packs code into a NuGet package
- `publish` – packs the app and dependencies for publishing

https://docs.microsoft.com/en-us/dotnet/core/tools/index?tabs=netcore2x

`dotnet run`

Run application from the source code

- Use **`dotnet`** without any command to run a built DLL

Uses **`dotnet build`** in the background

Important parameters

- `--framework`
- `--configuration <Debug|Release>`

https://docs.microsoft.com/en-us/dotnet/articles/core/preview3/tools/dotnet-run

Deployment (`dotnet publish`)

Framework-dependent deployment

- Shared system-wide version of .NET Core must be present on target system
- DLLs are launched using **`dotnet`**
- DLLs are portable

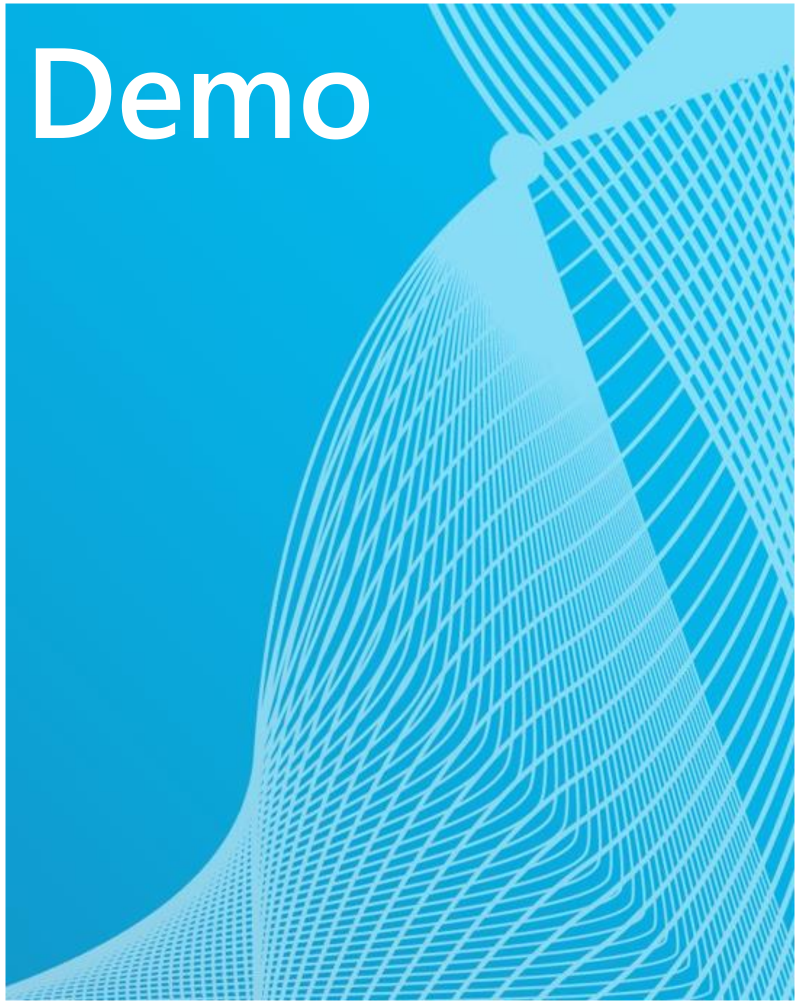
Self-contained deployment

- No prerequisites on target system necessary
- Does *not* contain native prerequisites
- Results in an platform-specific executable

Optional: Use CrossGen for native image generation

https://docs.microsoft.com/en-us/dotnet/core/deploying/

Self-contained Deployment



Create self-contained sample

- See following slides

Build and publish SCD

```
dotnet publish -c release
dotnet publish -c release -r win-x64
dotnet publish -c release -r linux-x64
```

Runtime Identifier (RID)
(details)

Release instead of debug version
(need not ship PDBs)

https://github.com/rstropek/Samples/tree/master/AspNetCore1Workshop/27-self-contained

Self-contained Deployment

```
<Project Sdk="Microsoft.NET.Sdk">

  <PropertyGroup>
    <OutputType>Exe</OutputType>
    <TargetFramework>netcoreapp2.0</TargetFramework>
  </PropertyGroup>

  <ItemGroup>
    <PackageReference Include="Newtonsoft.Json" Version="10.0.3" />
  </ItemGroup>

</Project>
```

Details: https://docs.microsoft.com/en-us/dotnet/articles/core/rid-catalog

Versioning

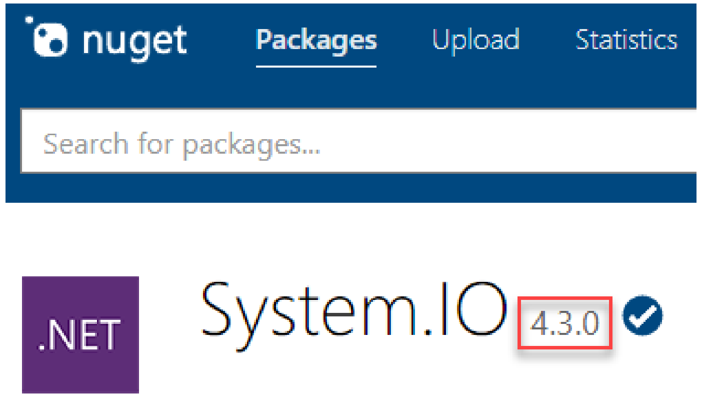
Versioning

Framework version changes when APIs are added

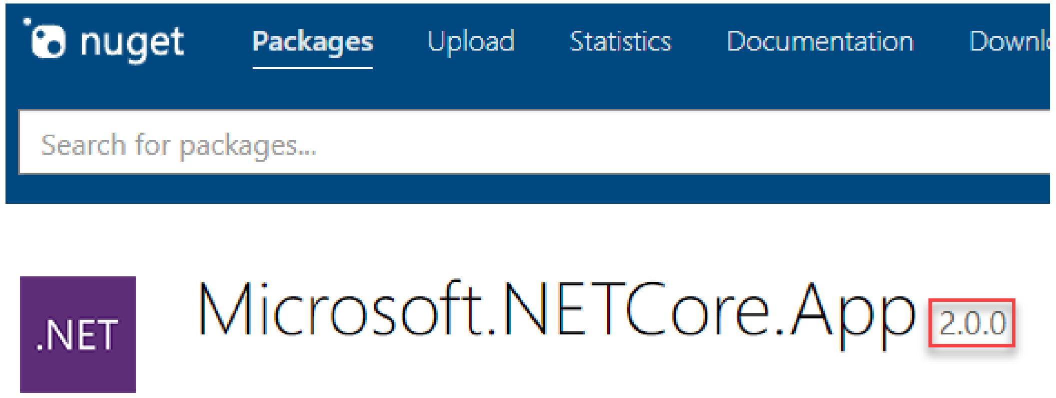
- No implementation → no patch numbers
- Example: `netcoreapp2.0`

Package versions

- `System.*` packages use 4.x numbers (overlap with .NET Framework)
- Packages without overlapping with .NET Framework → 1.x/2.x



System.IO 4.3.0



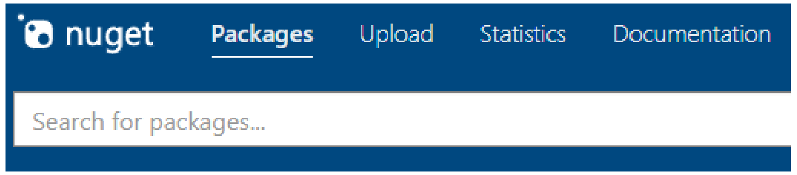
Microsoft.NETCore.App 2.0.0

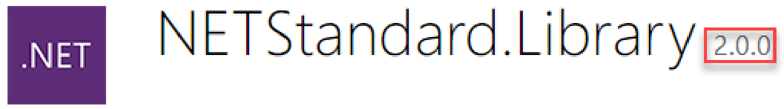
https://docs.microsoft.com/en-us/dotnet/articles/core/versions/index

Versioning

.NET Standard Library

- Versioning independent of any .NET runtime, applicable to multiple runtimes
- 2.0 for .NET Core 2.0





Examples

https://docs.microsoft.com/en-us/dotnet/articles/core/versions/index

Libraries

Libraries

Demo

Shared files

Libraries

Creating NuGet packages

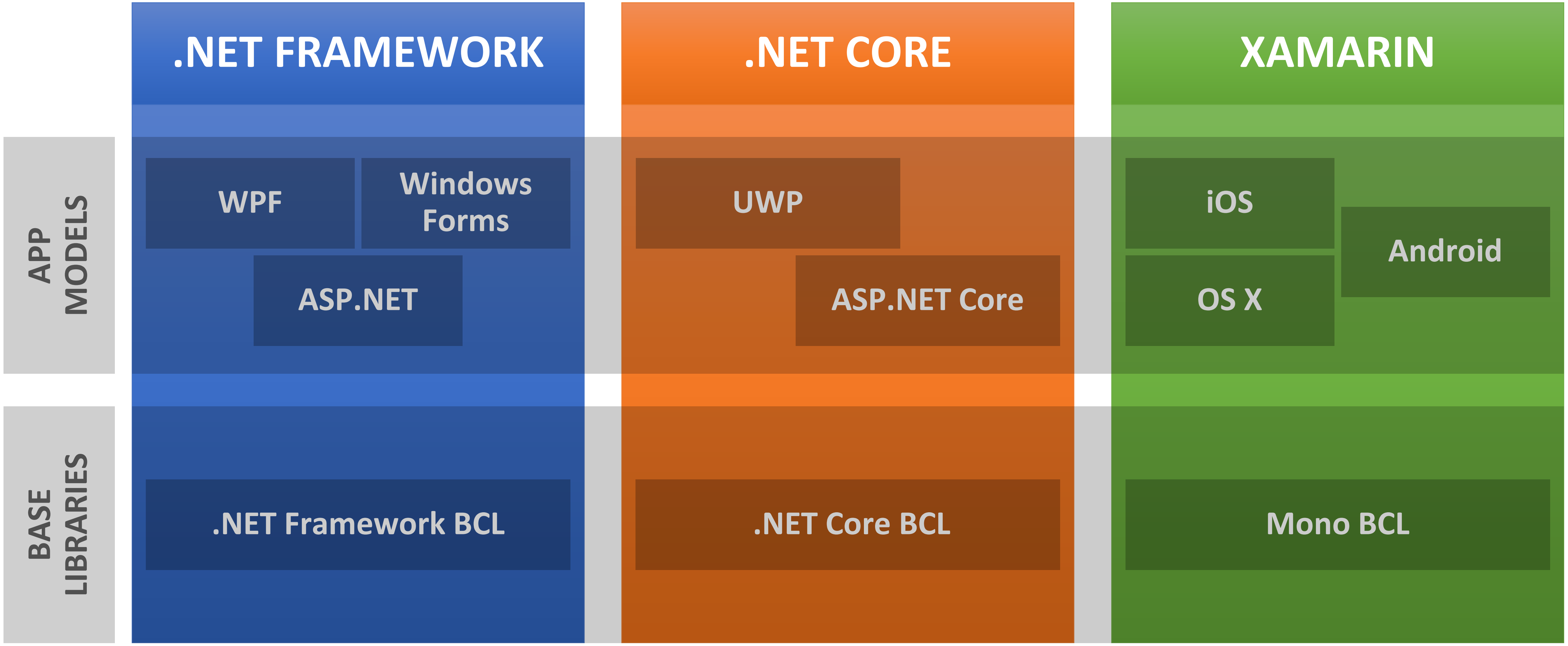
```
dotnet pack
```

Further readings

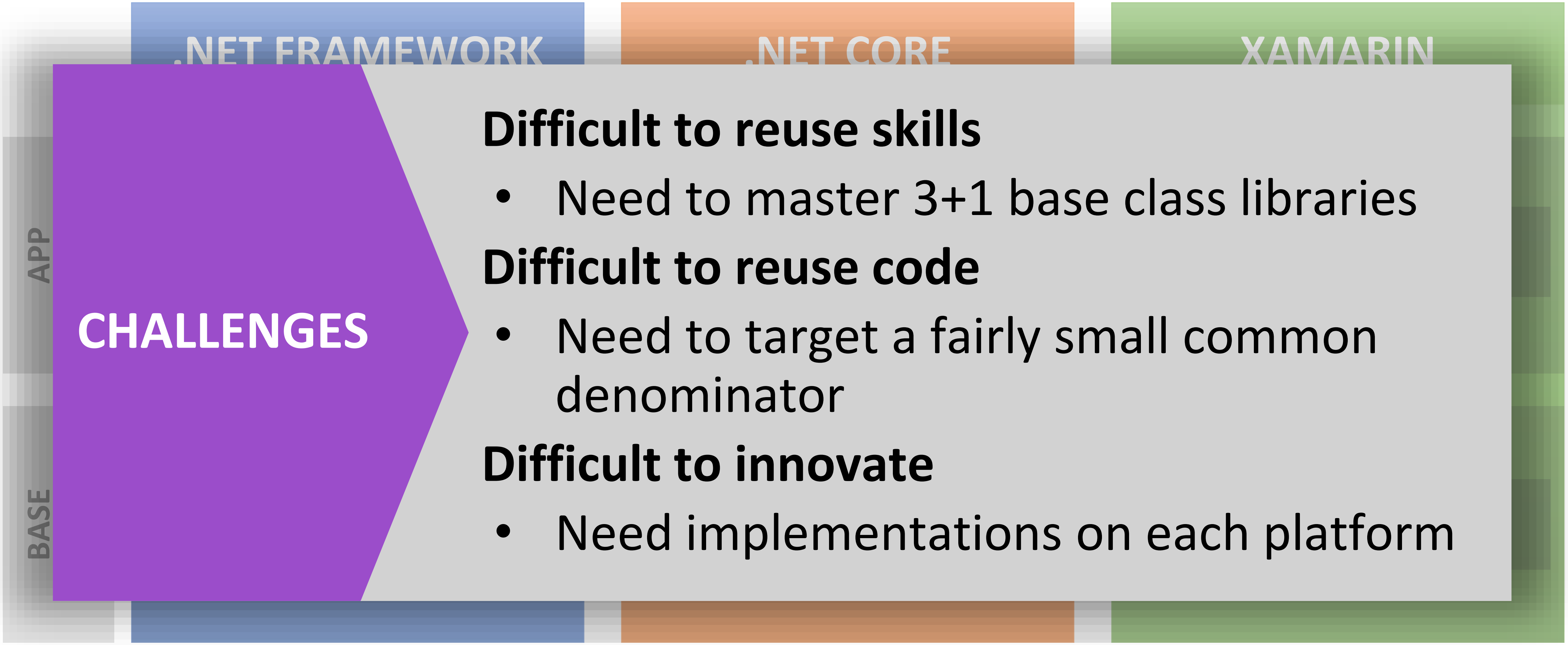
- More about cross-platform libraries
- Tools for porting code from .NET Framework

.NET Standard Library

.NET today—reusing code



.NET today—reusing code



CHALLENGES

Difficult to reuse skills

- Need to master 3+1 base class libraries

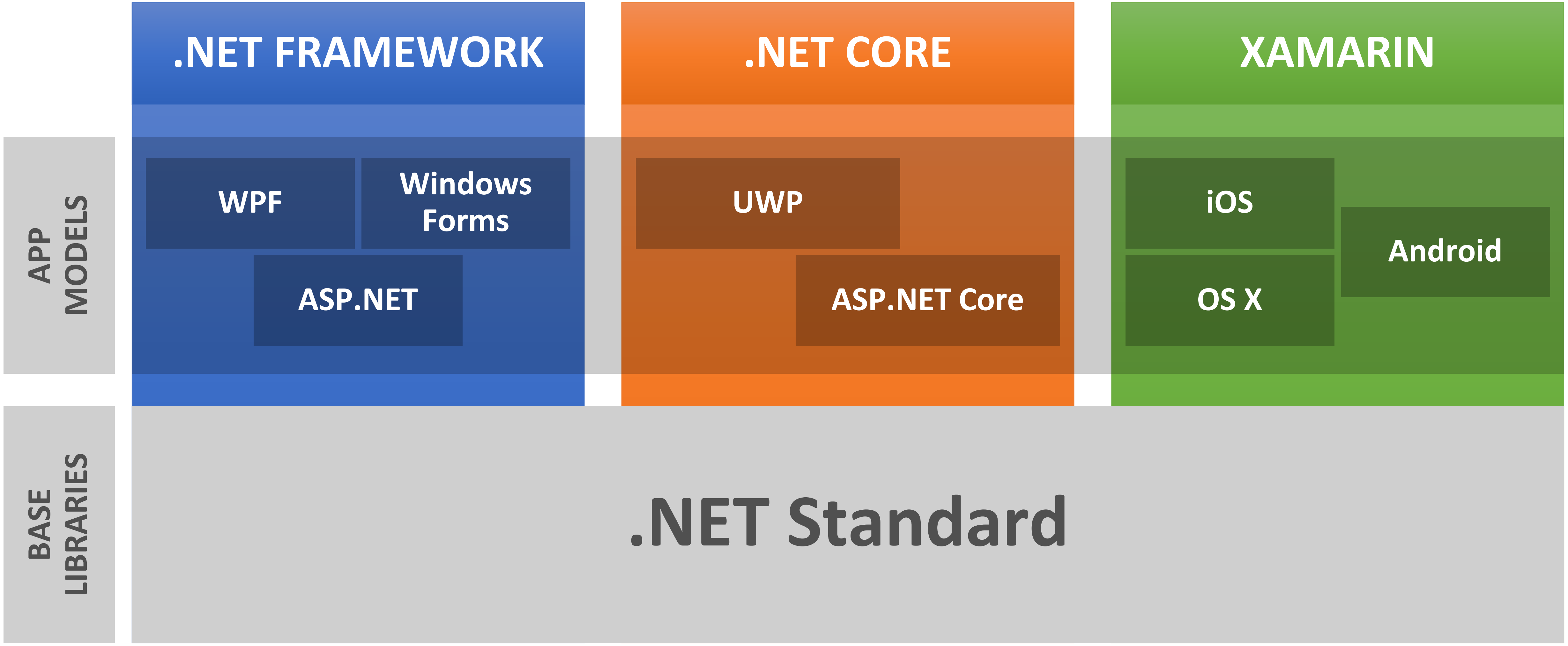
Difficult to reuse code

- Need to target a fairly small common denominator

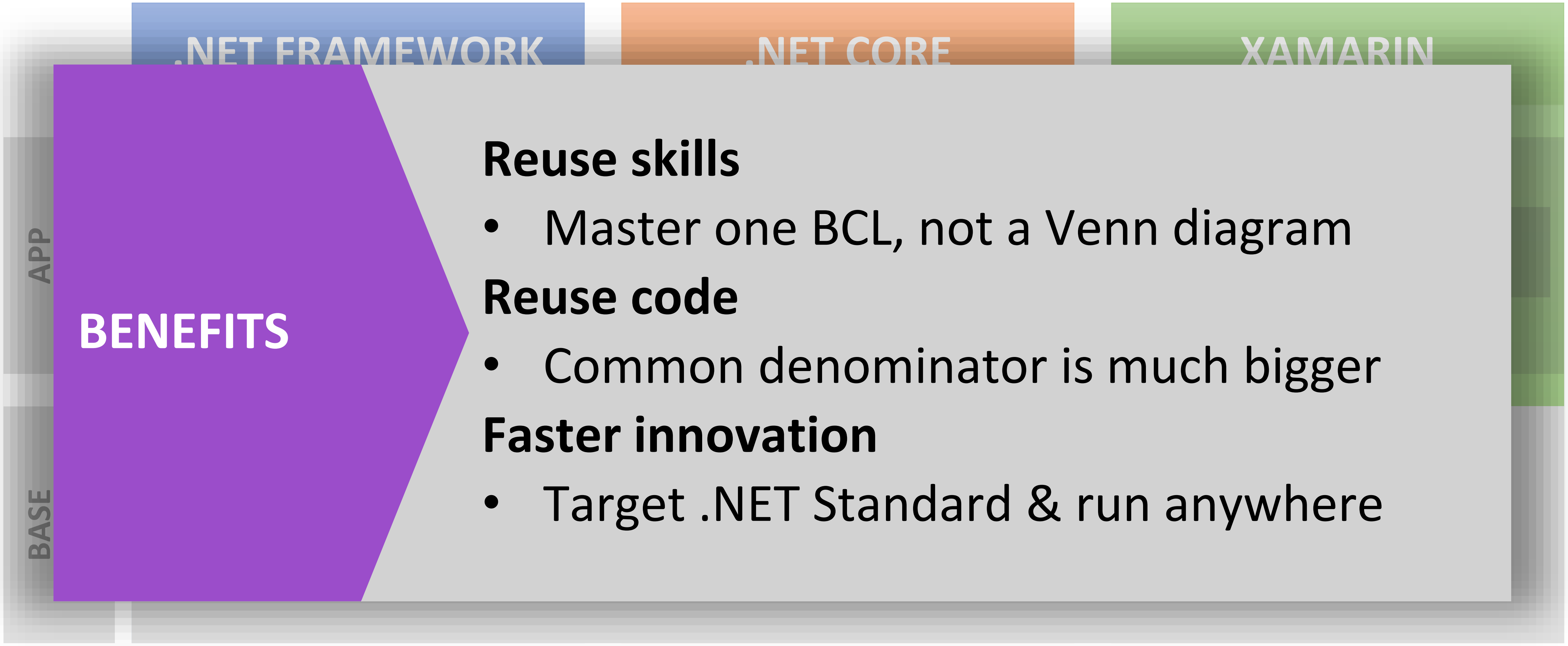
Difficult to innovate

- Need implementations on each platform

.NET tomorrow



.NET tomorrow



BENEFITS

Reuse skills

- Master one BCL, not a Venn diagram

Reuse code

- Common denominator is much bigger

Faster innovation

- Target .NET Standard & run anywhere

What is .NET Standard?

- .NET Standard **is a specification**
- A set of APIs that **all .NET platforms have to implement**

.NET Standard	**~**	**HTML specification**
.NET Framework	**~**	**Browsers**
.NET Core		
Xamarin		

.NET Standard 2.0

Has much bigger API surface

- Extended to cover intersection between .NET Framework and Xamarin
- Makes .NET Core 2.0 bigger as it implements .NET Standard 2.0

Can reference .NET Framework libraries

- Compat shim allows referencing existing .NET Framework code – without recompilation
- Limited to libs that use APIs that are available for .NET Standard

+20K

More APIs than .NET Standard 1.x

~70%

of NuGet packages are API compatible

Why a standard library?

CLR (CLI) has already been standardized (ECMA 334)

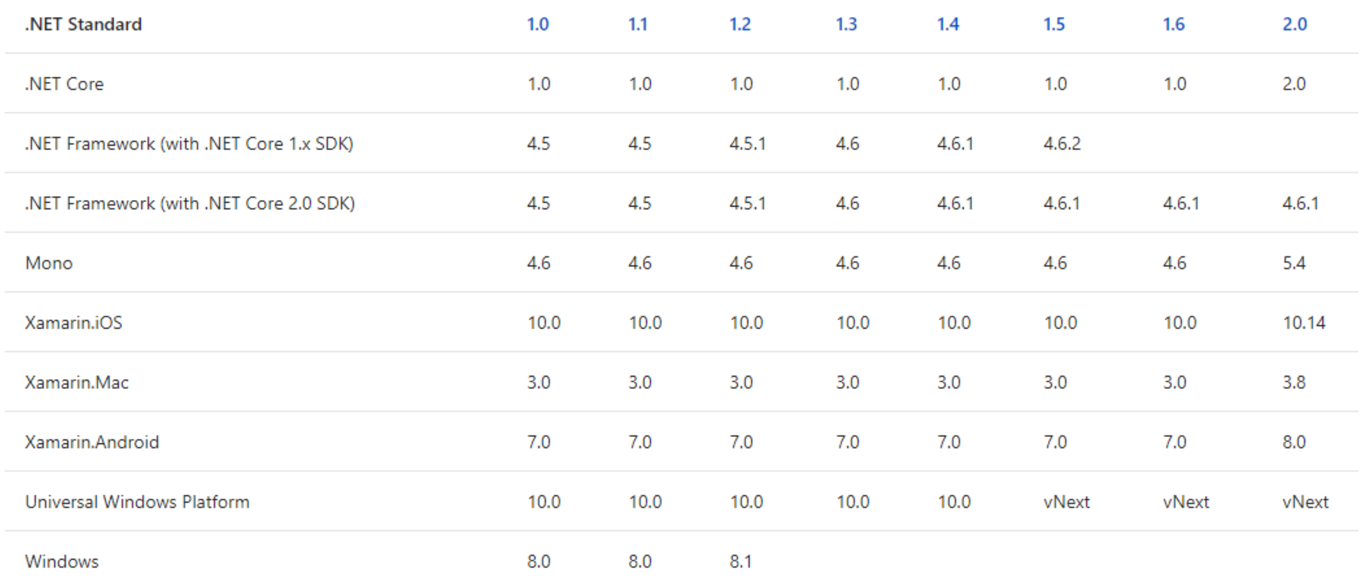
- No standardized BCL prior to .NET Core

Goal: Standard BCL API for all .NET platforms

- Easier to create portable libraries
- Reduce conditional compilation

What about PCLs?

- Well defined API instead of just intersection of platforms
- Better versioning
- Overlapping PCL profiles (details)



.NET Standard	1.0	1.1	1.2	1.3	1.4	1.5	1.6	2.0
.NET Core	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0
.NET Framework (with .NET Core 1.x SDK)	4.5	4.5	4.5.1	4.6	4.6.1	4.6.2		
.NET Framework (with .NET Core 2.0 SDK)	4.5	4.5	4.5.1	4.6	4.6.1	4.6.1	4.6.1	4.6.1
Mono	4.6	4.6	4.6	4.6	4.6	4.6	4.6	5.4
Xamarin.iOS	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.14
Xamarin.Mac	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8
Xamarin.Android	7.0	7.0	7.0	7.0	7.0	7.0	7.0	8.0
Universal Windows Platform	10.0	10.0	10.0	10.0	10.0	vNext	vNext	vNext
Windows	8.0	8.0	8.1					

Details: https://docs.microsoft.com/en-us/dotnet/articles/standard/library

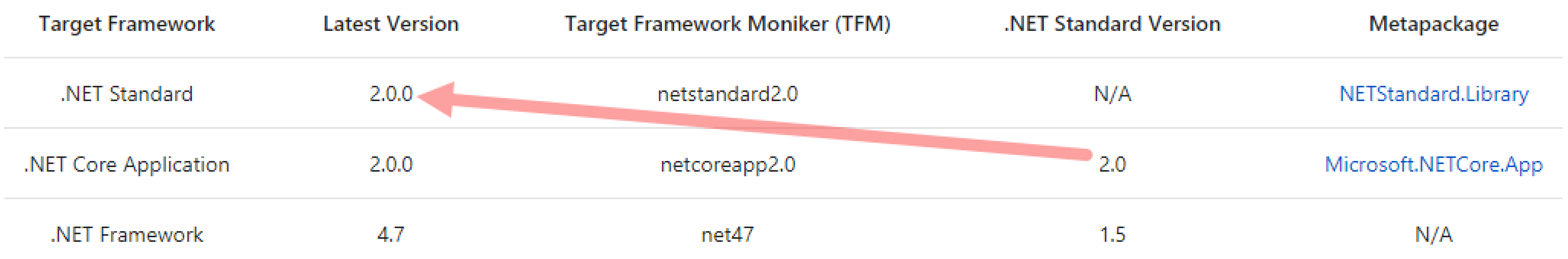
.NET Standard Library

Standard APIs defined as empty C# classes

Example: `ref` folder in `System.Runtime`

`NETStandard.Library` (NuGet)

Metapackage for .NET Standard Library



Target Framework	Latest Version	Target Framework Moniker (TFM)	.NET Standard Version	Metapackage
.NET Standard	2.0.0	netstandard2.0	N/A	NETStandard.Library
.NET Core Application	2.0.0	netcoreapp2.0	2.0	Microsoft.NETCore.App
.NET Framework	4.7	net47	1.5	N/A

Details: https://docs.microsoft.com/en-us/dotnet/articles/standard/frameworks

Migration

.NET Portability Analyzer

- https://github.com/Microsoft/dotnet-apiport

Reference .NET Framework assemblies

- They just work, without recompile

.NET Portability Analyzer

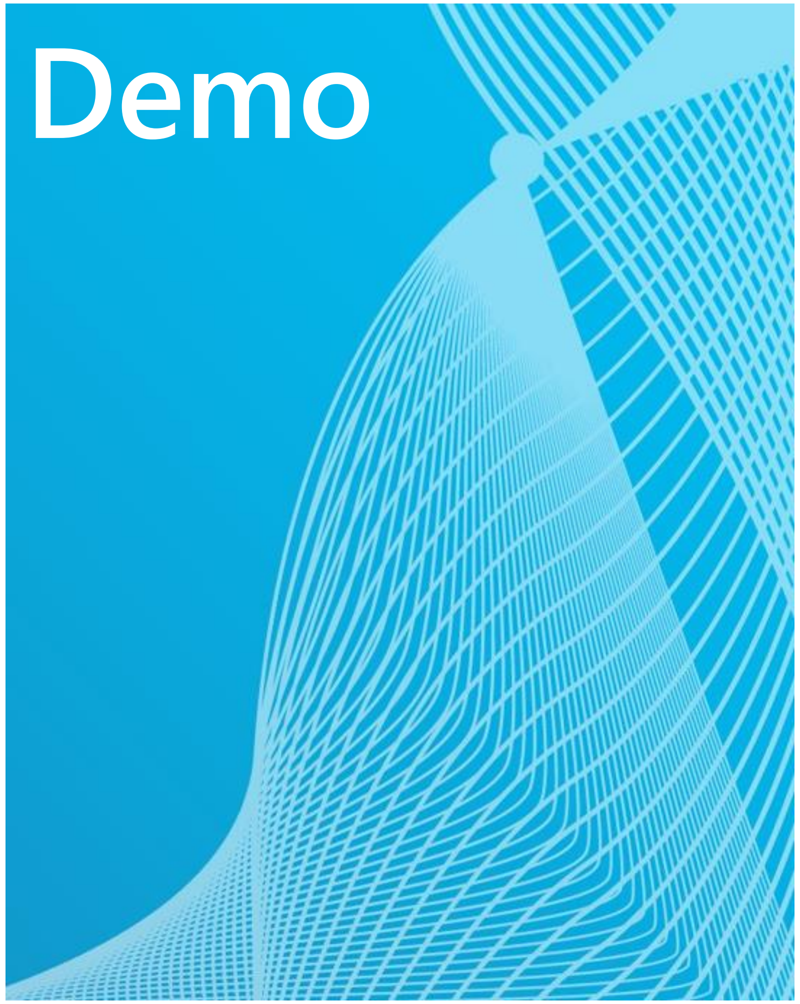
Demo

NQuery

ASP.NET Core Basics

Practical use of .NET Core

Minimal ASP.NET Core



- ASP.NET Pipeline
- Discuss "a la carte" framework
  - Add static files (sample)
- Kestrel
  - Windows, Linux with Docker
- Visual Studio Code
- Further readings
  - Building middlewares

https://github.com/rstropek/Samples/tree/master/AspNetCoreWorkshop/50-simplest-aspnet

Walkthrough VS “File – New – Project”

Demo

Create web project in VS2015

Walkthrough

- Servers (IIS and Kestrel)
- Environments
- Adding MVC

101 for ASP.NET Core

Application Startup

- `Main` Method
- `Startup` class with `ConfigureServices` (DI) and `Configure` (Pipeline)

Static Files

Environments

Servers

- IIS, Kestrel

Configuration

No `web.config` anymore

Key/value pair settings from different providers

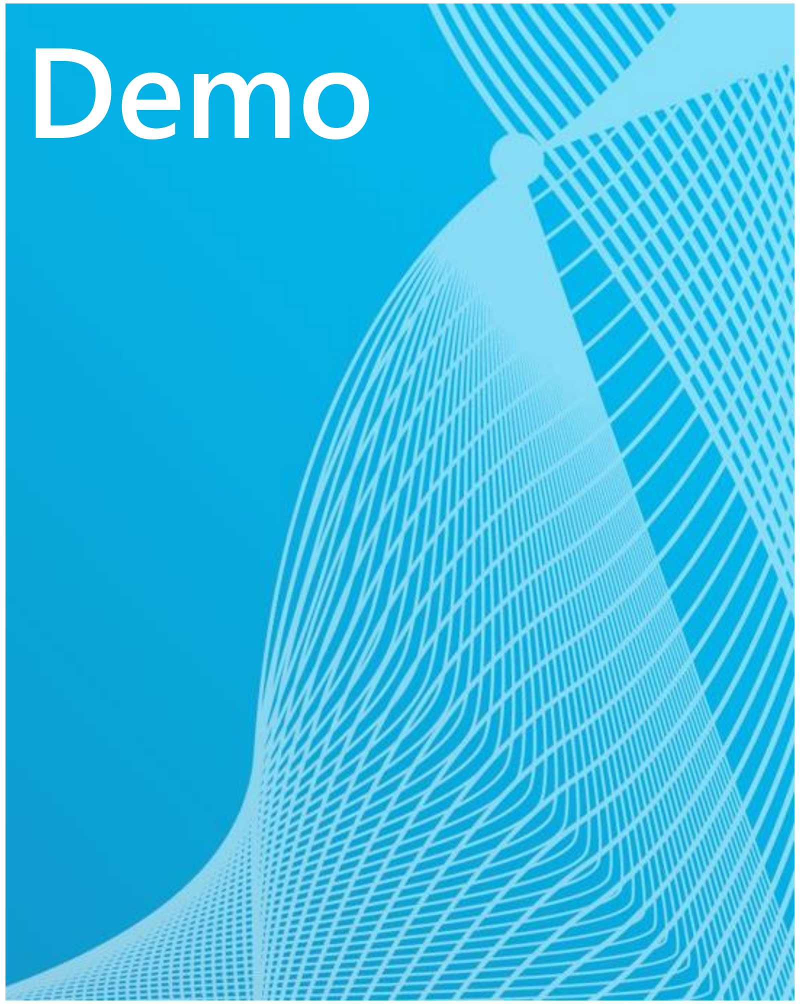
- E.g. memory, environment variables, JSON, INI, XML

Extensible

- Details about writing custom providers

Options pattern for DI integration

Configuration



In-memory configuration

JSON configuration

Configuration via command line

Configuration with environment variables

Options pattern

See practical use in AppInsights

https://github.com/rstropek/Samples/tree/master/AspNetCoreWorkshop/55-configuration/

Logging

Support for logging built into ASP.NET Core

Various logger built in

- E.g. console, NLog

Details about logging

Consider using Application Insights

- Getting started with AppInsights in ASP.NET Core

Logging

Demo

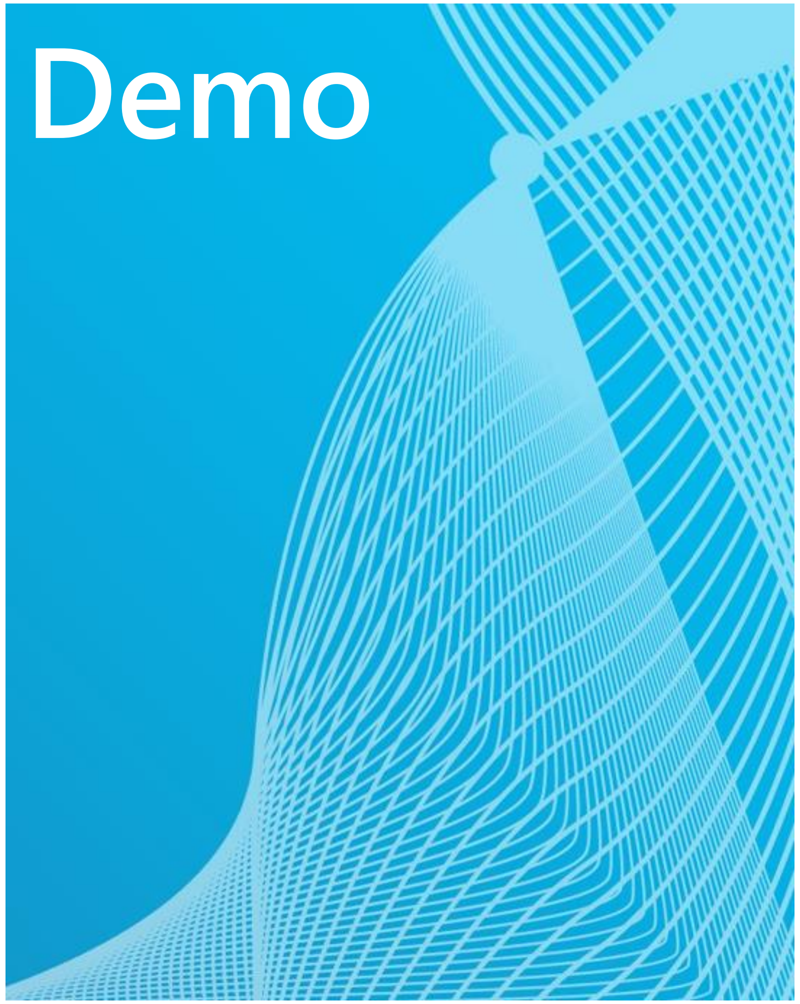
- JSON file to configure logging
  - .NET Core Logging
  - AppInsights
- Custom logging
- AppInsights portal

https://github.com/rstropek/Samples/tree/master/AspNetCoreWorkshop/58-logging/

Dependency Injection

- Support for DI built into ASP.NET Core
  - Details about DI
- Framework-provided services and your own services
- Service Lifetime
  - Transient, Scoped, Singleton, Instance
- Default container can be replaced (details)

Dependency Injection



Setting up DI

Service Lifetime

https://github.com/rstropek/Samples/tree/master/AspNetCoreWorkshop/60-di-scopes/

.NET Core Automation

Test, build, and release automation

CI with .NET Core apps

VSTS supports building and publishing .NET Core apps

- Details

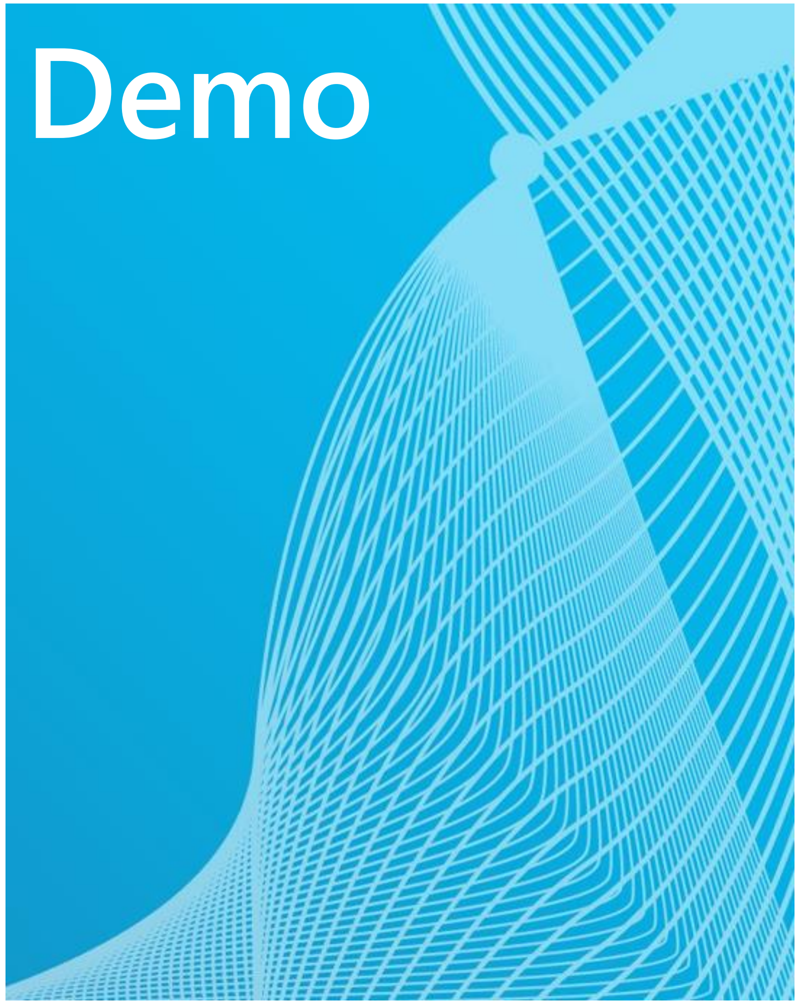
Azure App Services supports .NET Core apps

- Kudu-support for .NET Core

Ready-made Docker image with `Dockerfile`

- `microsoft/dotnet`

Build Automation



Build and deploy .NET Core in VSTS

https://www.visualstudio.com/en-us/docs/build/apps/aspnet/aspnetcore-to-azure

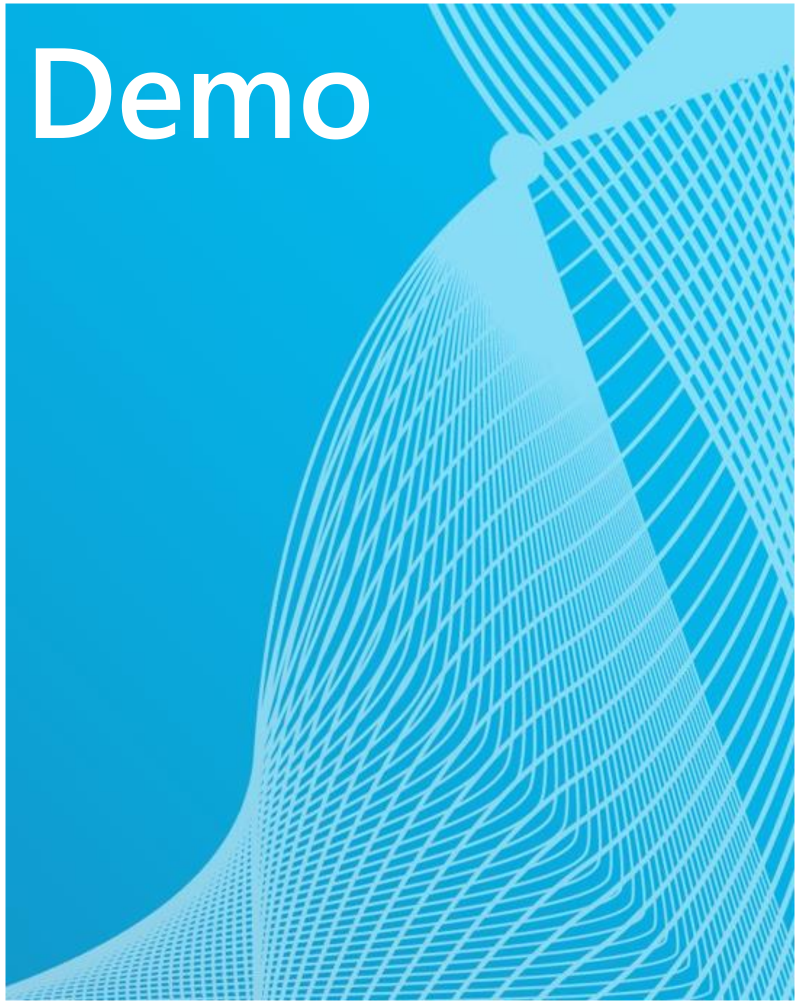
Dockerfile for .NET Core app

Demo

Unit Testing

- .NET Core supports multiple test frameworks
  - E.g. XUnit, MSTest
  - Compare XUnit and MSTest

Unit Testing



Create and run library with tests

- XUnit (sample)
- MSTest (sample)

Run tests with

```
dotnet xunit
dotnet test
```

See also https://xunit.github.io/docs/getting-started-dotnet-core

C# 7

Live Coding; sample code see https://github.com/rstropek/Samples/tree/master/CSharp7

Thank you for coming!

Questions?