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What is new in .NET 5 and the future of .NET

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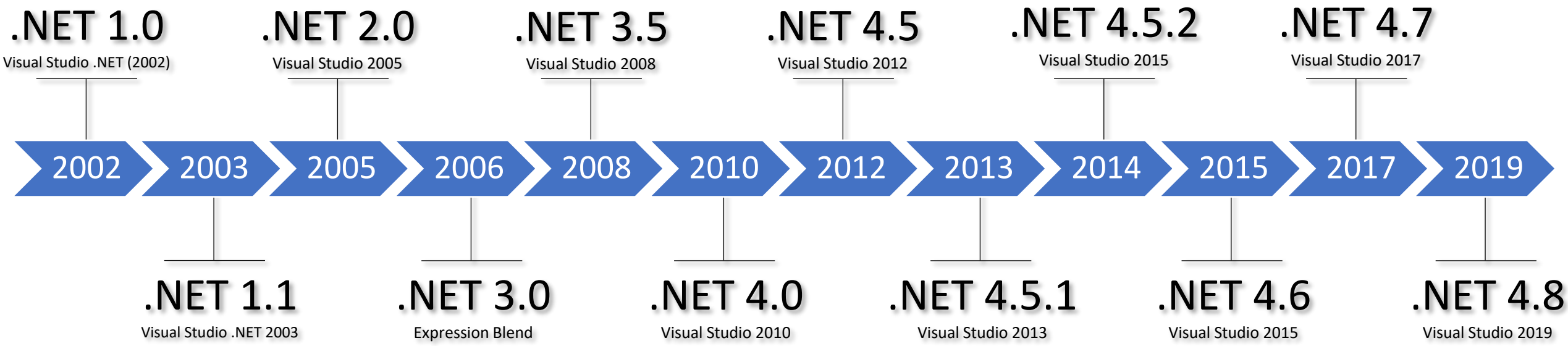
.NET: a quick history



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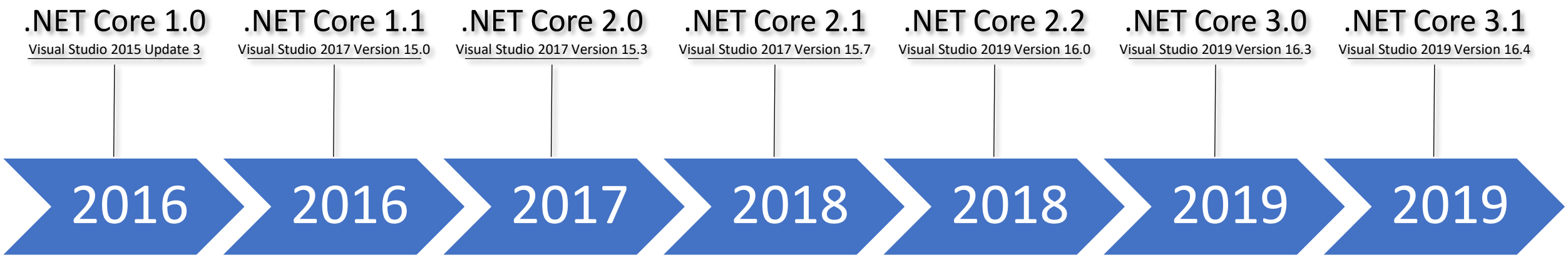
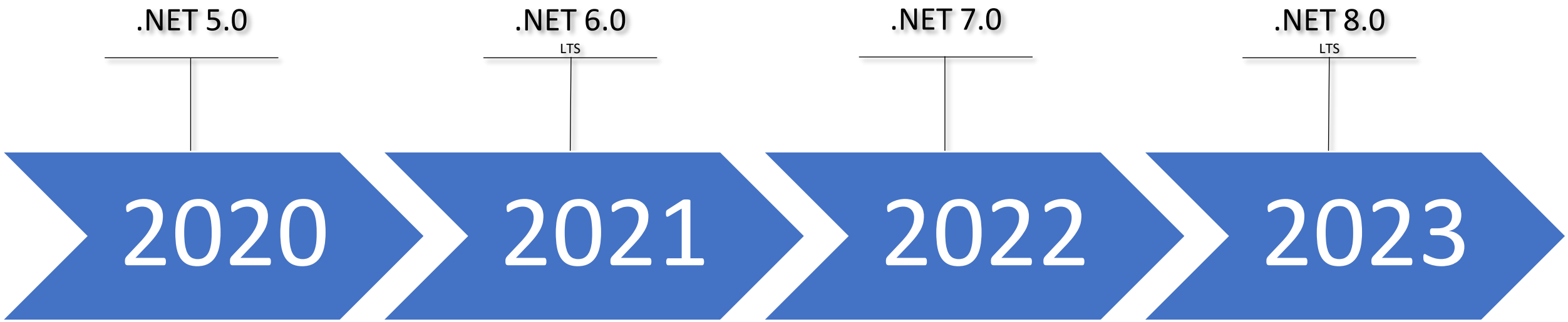
.NET Core: a quick history



.NET Core 1.0	**June 27, 2019**
.NET Core 1.1	**June 27, 2019**
.NET Core 2.0	**October 1, 2018**
.NET Core 2.1	**August 21, 2021**
.NET Core 2.2	**December 23, 2019**
.NET Core 3.0	**March 3, 2020**
.NET Core 3.1	**December 3, 2022**

.NET: what about the future?



.NET 5	**3 months after .NET 6 release (around February 2022)**
.NET LTS	**Three years after initial release**

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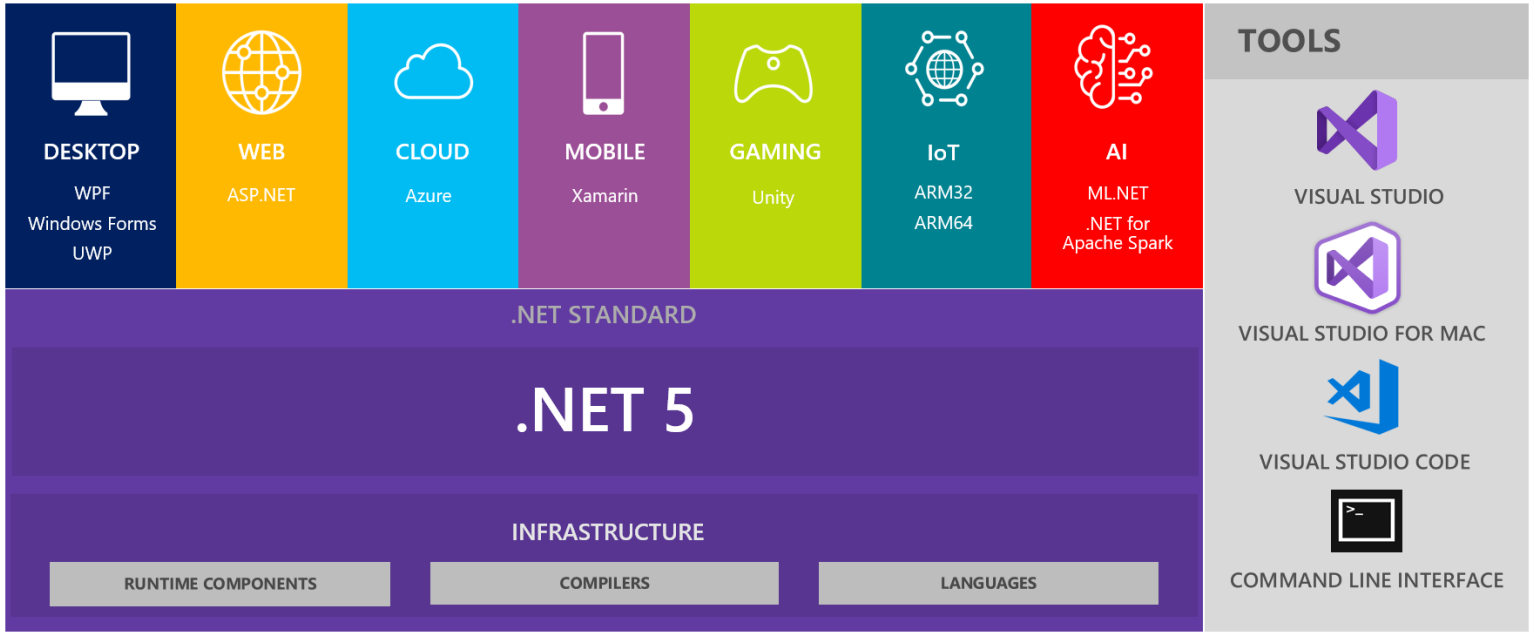
.NET as multi-platform

- CLR, Mono, …
- Portable Class Libraries
- .NET Standard
- .NET 5

.NET = A unified platform



https://devblogs.microsoft.com/dotnet/introducing-net-5/

.NET 5 = .NET Core vNext

- Single runtime and BCL
- Unified developer experience
- Expand .NET with capabilities of .NET Core, .NET Framework, Xamarin and Mono
- Single open-source code base

.NET Framework, .NET Core or .NET 5?

- .NET Framework will NOT get new features but will stay supported with every new version of Windows (.NET 4.8 is part of Windows)
- .NET Core 3.1 is LTS (12/2022) but will NOT get new features
- .NET Standard 2.1 will be the last version
- .NET 5 supports .NET Standard 2.1
- .NET Standard 2.0 is the last supported by .NET Framework


THIS DEMO USES
"PRODUCTION-READY CODE"

Example 1 – Single SDK Experience

- Single CLI
- Single *.csproj format
- Target framework names (TFM)
- “net5.0” replaces and combines “netcoreapp” and “netstandard”
- “net5.0-windows” is OS-specific and includes OS-specific bindings
  - “net6.0-android”, “net6.0-ios”

Example 1 – Single SDK Experience

```
<PropertyGroup>
    <OutputType>Exe</OutputType>
    <TargetFramework>net5.0</TargetFramework>
    <RootNamespace>_01_SingleSdkExperience.DotNet5</RootNamespace>
</PropertyGroup>
```

Example 1 – Single SDK Experience

```
<PropertyGroup>
    <OutputType>WinExe</OutputType>
    <TargetFramework>net5.0-windows</TargetFramework>
    <RootNamespace>_01_SingleSdkExperience.WinForms</RootNamespace>
    <UseWindowsForms>true</UseWindowsForms>
</PropertyGroup>
```

Example 1 – Single SDK Experience

```
<PropertyGroup>
    <OutputType>WinExe</OutputType>
    <TargetFramework>net5.0-windows</TargetFramework>
    <RootNamespace>_01_SingleSdkExperience.Wpf</RootNamespace>
    <UseWPF>true</UseWPF>
</PropertyGroup>
```

Example 2 – Default Executables

- Since .NET Core 3.0
- <OutputType>Exe</OutputType> for executable project templates
- Generates *.exe (wrapper) next to .NET DLL

```
<PropertyGroup>
    <OutputType>Exe</OutputType>
    <TargetFramework>net5.0</TargetFramework>
    <RootNamespace>_02_DefaultExecutables</RootNamespace>
</PropertyGroup>
```

Example 3 – Single file applications

- Since .NET Core 3.0
- Publish feature
- Includes runtime and dependencies
- Platform SDK decides how to build native executable

```
<RuntimeIdentifier>win10-x64</RuntimeIdentifier>
<PublishSingleFile>true</PublishSingleFile>
```

Example 3 – Single file applications

```
<PropertyGroup>
    <OutputType>Exe</OutputType>
    <TargetFramework>net5.0</TargetFramework>
    <RootNamespace>_03_SingleFileApplications</RootNamespace>
    <RuntimeIdentifier>win10-x64</RuntimeIdentifier>
    <PublishSingleFile>true</PublishSingleFile>
</PropertyGroup>
```

Example 4 – Assembly Linking

- Since .NET Core 3.0
- Publish feature
- Includes runtime and dependencies
- Strips unused dependencies as much as possible
- Platform SDK decides how to build native executable

```
<RuntimeIdentifier>win10-x64</RuntimeIdentifier>
<PublishSingleFile>true</PublishSingleFile>
<PublishTrimmed>true</PublishTrimmed>
```

Example 4 – Assembly Linking

```
<PropertyGroup>
    <OutputType>Exe</OutputType>
    <TargetFramework>net5.0</TargetFramework>
    <RootNamespace>_04_AssemblyLinking</RootNamespace>
    <RuntimeIdentifier>win10-x64</RuntimeIdentifier>
    <PublishSingleFile>true</PublishSingleFile>
    <PublishTrimmed>true</PublishTrimmed>
</PropertyGroup>
```

Example 5 – Hardware Intrinsics

- Since .NET Core 1.0 (SIMD, System.Numerics)
- Since .NET Core 3.0 (System.Runtime.Intrinsics)
- Since .NET 5 (support for ARM)
- SIMD has fallback if not supported on CPU
- Intrinsics does NOT have fallback if not supported on CPU

```
using System.Numerics;
using System.Runtime.Intrinsics;
using System.Runtime.Intrinsics.Arm;
using System.Runtime.Intrinsics.X86;
```

Example 5 – Hardware Intrinsics

```
while (i < lastBlockIndex)
{
    resultVector = Sse2.Add(resultVector, Sse2.LoadVector128(sourcePointer + i));
    i += 4;
}
resultVector = Ssse3.HorizontalAdd(resultVector, resultVector);
resultVector = Ssse3.HorizontalAdd(resultVector, resultVector);

while (i < lastBlockIndex)
{
    resultVector = AdvSimd.Add(resultVector, AdvSimd.LoadVector128(sourcePointer + i));
    i += 4;
}
resultVector = AdvSimd.Add(resultVector, resultVector);
resultVector = AdvSimd.Add(resultVector, resultVector);
```

Example 6 – New dev templates

- Since .NET Core 2.0 and 3.0, also supported in .NET 5
- Worker Service (Comparable: Windows Service in .NET Framework)
- gRPC Service (Comparable: WCF Service in .NET Framework)
- WPF template
- WinForms template

Example 7 – C# 9.0 features

- Top-level programs
- Target typed new()-expressions
- Init-only properties
- Records
- (No language support for the new System.Half type)

Example 7 – C# 9.0 – Top-level

```
using System;
using System.Runtime.InteropServices;

Console.WriteLine("Hello World!");
FromWhom();
Show.Excitement("Top-level programs can be brief", 8);
```

Example 7 – C# 9.0 – new()

```
using System.Collections.Generic;

Dictionary<string, string> dictionary1 = new Dictionary<string, string>();
var dictionary2 = new Dictionary<string, string>();
Dictionary<string, string> dictionary3 = new();
```

Example 7 – C# 9.0 – init

```
public class Person
{
    public string Name { get; init; }
    public string FirstName { get; init; }
}
```

Example 7 – C# 9.0 – records

```
public record Person(string Name, string FirstName);

Person person1 = new("Hooyberghs", "Johnny");
Person person2 = person1 with { FirstName = "Marina" };
```

Example 7 – C# 9.0 – Half

```
Half half1 = 0;
Half half2 = 0.0;
Half half = (Half)0;
float f = (float)half;
Half h = (Half)f;
```

Example 8 – Windows Api's

- Windows API's are automatically available based on the TFM
- TFM net5.0-windows including minimum supported version
- net5.0-windows10.0.17763.0

```
<PropertyGroup>
    <OutputType>WinExe</OutputType>
    <TargetFramework>net5.0-windows10.0.17763.0</TargetFramework>
    <RootNamespace>_08_WindowsApis.WinForms</RootNamespace>
    <UseWindowsForms>true</UseWindowsForms>
</PropertyGroup>
```

Example 8 – Windows Api's

```
private async void button1_Click(object sender, EventArgs e)
{
    // Initialize the webcam
    MediaCapture captureManager = new MediaCapture();
    await captureManager.InitializeAsync();

    ImageEncodingProperties imgFormat = ImageEncodingProperties.CreateJpeg();
    // create storage file in local app storage
    StorageFile file = await KnownFolders.CameraRoll.CreateFileAsync("TestPhoto.jpg",
                                    CreationCollisionOption.GenerateUniqueName);

    // take photo
    await captureManager.CapturePhotoToStorageFileAsync(imgFormat, file);

    var image = Image.FromFile(file.Path);
    pictureBox1.Image = image;
}
```

Example 9 – Source Generators

- Autogenerate source-code during compilation step
- Based on Roslyn Analyzers
- Generated source-code is not part of your project, but is added to the compiled binary
- Source generators can be redistributed using NuGet packages

Example 9 – Source Generators

```
[Generator]
public class Generator : ISourceGenerator
{
    public void Initialize(GeneratorInitializationContext context)
    {
    }

    public void Execute(GeneratorExecutionContext context)
    {
    }
}
```

Example 10 – Project Tye

- Experimental developer tool
- Better support for developing and testing distributed applications
- Run multiple services with a single command
- Service-address discovery
- Custom single-file configuration
- Support for .NET Core 3.1 onwards

Example 10 – Project Tye

```
name: projecttye
services:
- name: projecttye-backend
  project: 10-ProjectTye.Backend/10-ProjectTye.Backend.csproj
- name: projecttye-worker
  project: 10-ProjectTye.Worker/10-ProjectTye.Worker.csproj
- name: redis
  image: redis
  bindings:
  - port: 6379
    connectionString: "${host}:${port}"
- name: redis-cli
  image: redis
  args: "redis-cli -h redis MONITOR"
```

Thank you, be professional, and have fun out there!

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