Sessions start at: 5.00PM and 6.15PM

Online Meeting Rules

Azure Meetup

FRANKFURT

- If not muted, mute yourself.
- Ask your questions in the chat window.
- Use mic if you are explicitly asked.
- If you want to show something, we will make you be a presenter
- If you like you can activate your camera. We love to see you all ☺
- Please do not spam the chat window.
- Do not post inappropriate content.
- Have fun. ☺

GFU Cyrus AG

gfu.net

FOCUS TOP ANBIETER FÜR WEITERBILDUNG 2022

FOCUS 43/2021 IN KOOPERATION MIT FACTFIELD

PRÄSENZ- UND ONLINESCHULUNGEN

FÜR ENTWICKLER, SOFTWAREARCHITEKTEN, ADMINS UND PROJEKTMANAGER

✓ Offene Schulungen

✓ Inhouse- / Firmenschulungen

✓ Individualschulungen

KUNDENAUSZEICHNUNG eKomi

8.031

EKOMI BEWERTUNGEN

★★★★★

100.542	1.658	26.236
TEILNEHMENDE	SEMINARTHEMEN	DURCHGEFÜHRTE SEMINARE

nano FRAMEWORK

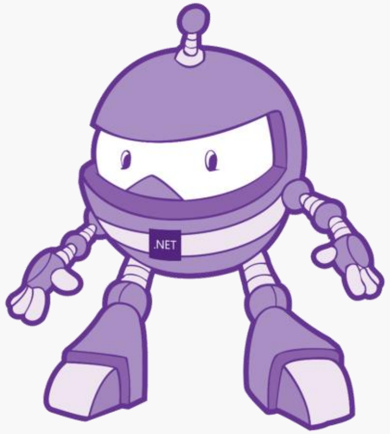
Making it easy to write C# code for embedded systems

eclo solutions

.NET foundation

Azure Meetup FRANKFURT

GFU Cyrus AG



.NET nanoFramework

José Simões – CEO Eclo Solutions, founder, core team lead
@Jose_Simoes

Steeltoe

Microsoft Web Protection Library

.NET Core

MSBuild

DotNetNuke

ASP.NET AJAX Control Toolkit

ASP.NET Core

SourceLink

Microsoft Azure WebJobs SDK

MVVM Light Toolkit

nUnit

Salesforce Toolkits for .NET

Mailkit

IronPython

WorldWide Telescope

Nancy

Open XML SDK

MvvmCross

MEF

JSON.NET

.NET SDK for Hadoop

Mimekit

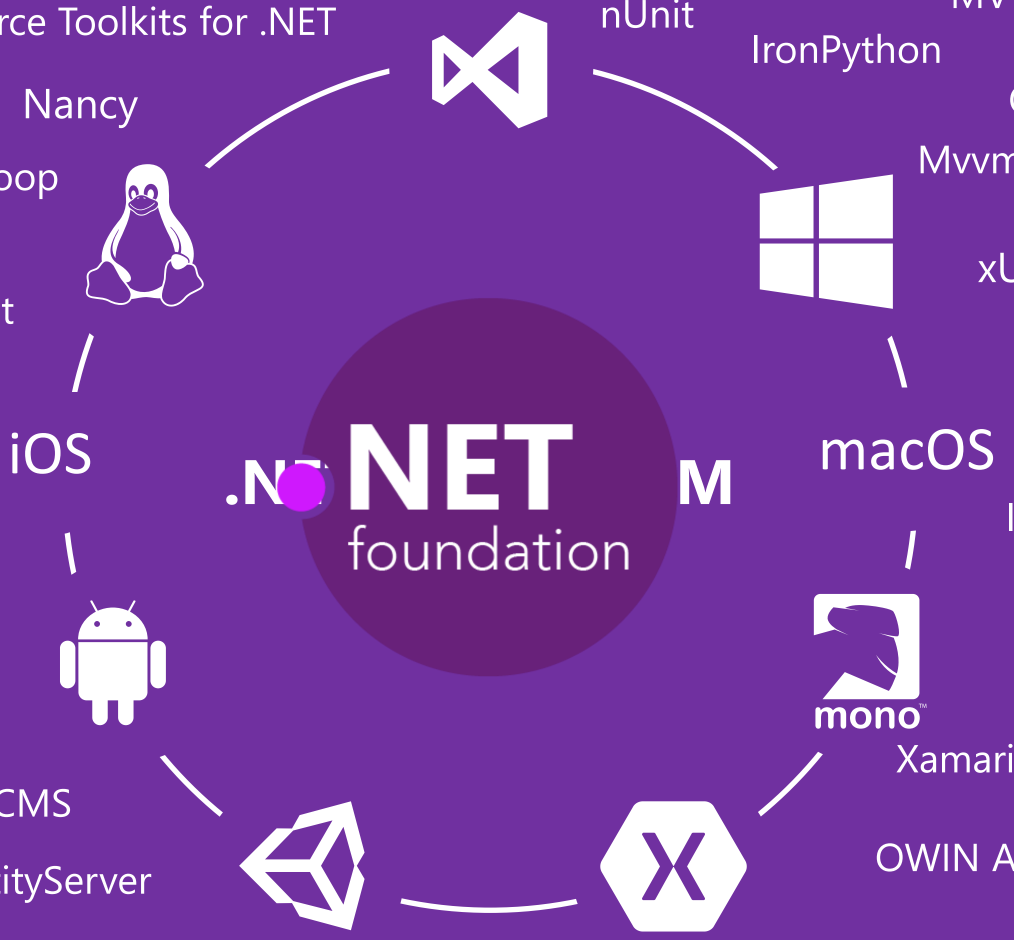
xUnit

ASP.NET Web Pages

NuGet

IdentityManager

Couchbase Lite for .NET



ML.NET

Entity Framework

WCF

MiniProfiler

ILMerge

Xamarin.Mobile

Infer.NET

ASP.NET SignalR

.NET Micro Framework

StackExchange.Redis

Mono

protobuf-net

Xamarin.Auth

Xamarin SDK

Open Live Writer

Orchard CMS

OWIN Authentication Middleware

ProtoBuild

IdentityServer

.NET nanoFramework

Microsoft Azure SDK for .NET

Prism

.NET Compiler Platform ("Roslyn")

Cake

ASP.NET Web API

Orleans

Kudu

LLILC

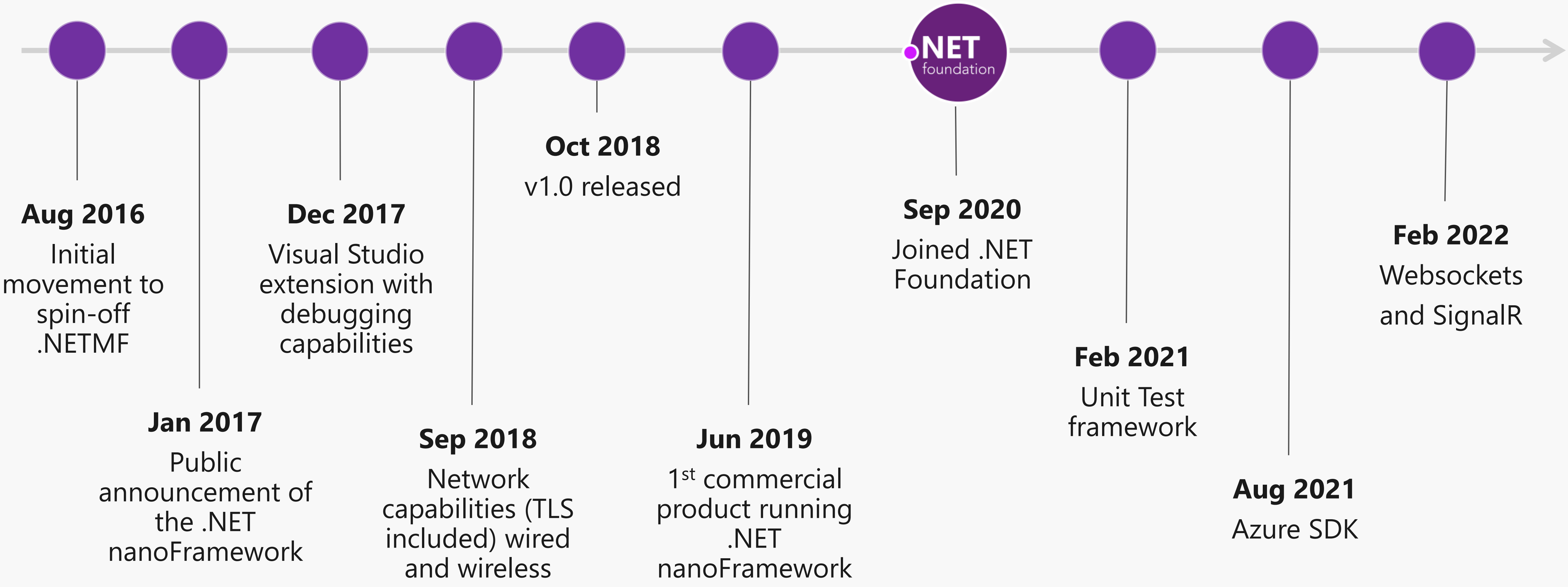
Umbraco

System.Drawing

ASP.NET MVC

Cecil

.NET nanoFramework Journey



Aug 2016
Initial movement to spin-off .NETMF

Jan 2017
Public announcement of the .NET nanoFramework

Dec 2017
Visual Studio extension with debugging capabilities

Sep 2018
Network capabilities (TLS included) wired and wireless

Oct 2018
v1.0 released

Jun 2019
1st commercial product running .NET nanoFramework

Sep 2020
Joined .NET Foundation

Feb 2021
Unit Test framework

Aug 2021
Azure SDK

Feb 2022
Websockets and SignalR

.NET nanoFramework Open Source

182

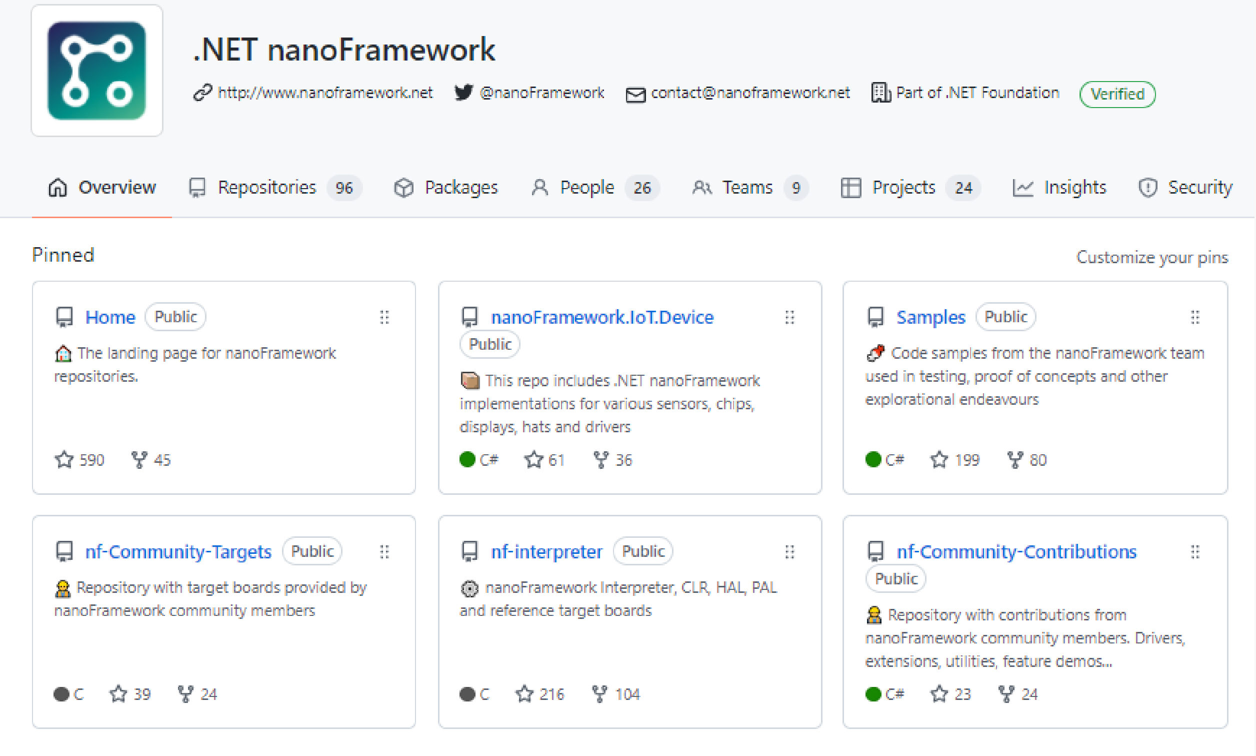
NuGet packages

+1,5M

NuGet packages downloads

+15k

Visual Studio Extension downloads



.NET nanoFramework

http://www.nanoframework.net @nanoFramework contact@nanoframework.net Part of .NET Foundation Verified

Pinned

Home Public
🏠 The landing page for nanoFramework repositories.
☆ 590 45

nanoFramework.IoT.Device Public
This repo includes .NET nanoFramework implementations for various sensors, chips, displays, hats and drivers
● C# ☆ 61 36

Samples Public
Code samples from the nanoFramework team used in testing, proof of concepts and other explorational endeavours
● C# ☆ 199 80

nf-Community-Targets Public
Repository with target boards provided by nanoFramework community members
● C ☆ 39 24

nf-interpreter Public
nanoFramework Interpreter, CLR, HAL, PAL and reference target boards
● C ☆ 216 104

nf-Community-Contributions Public
Repository with contributions from nanoFramework community members. Drivers, extensions, utilities, feature demos...
● C# ☆ 23 24

Repositories
90

Contributors
70

Code lines
+500k

Stars
+2k

Forks
+600

What is .NET nanoFramework?

- Shrunk .NET Common Language Runtime, small and efficient, ready to run on constrained embedded devices
- Enables the writing of managed applications in C#
- Subset of the .NET Base Class Library
- Most common .NET APIs (threading, collections, math, …)

What is .NET nanoFramework?

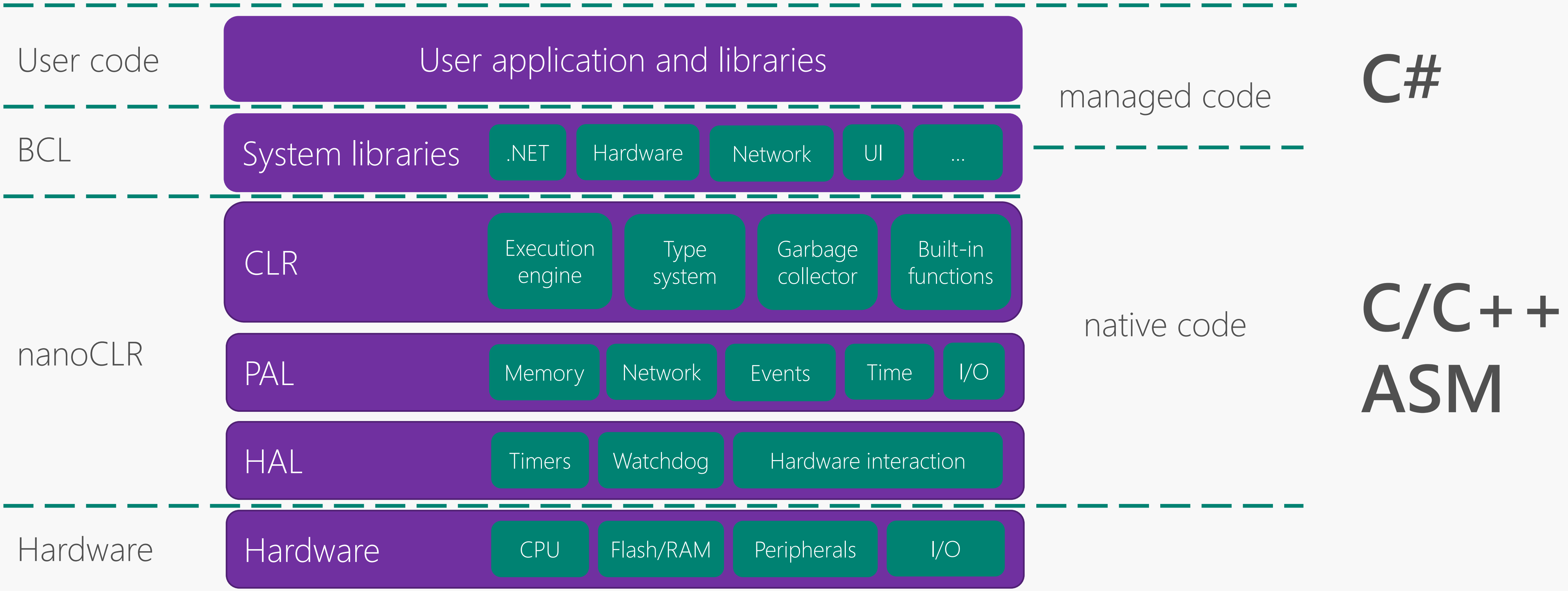
- Native multithreading
- Support for Interop code
- API aligned with .NET Core IoT
- Capable of running on any 32 bits core
- Basically it’s about a couple of threads running on top of *any* RTOS

What .NET nanoFramework is NOT

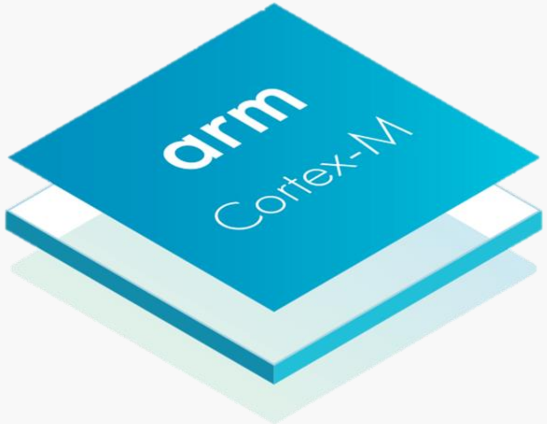
- It is **not** an RTOS (but runs on top of one)
- Does **not** have a JIT
- It is **not** capable of using standard .NET assemblies

Demo:
Hello World

.NET nanoFramework Architecture



Supported platforms



- Any 32 bits core e.g. ARM Cortex-M, Tensilica Xtensa LX6/7 (ESP32/S2)
- Internal or external flash (XIP) **~128kB**
- Internal or external RAM **~64kB**

Supported RTOS

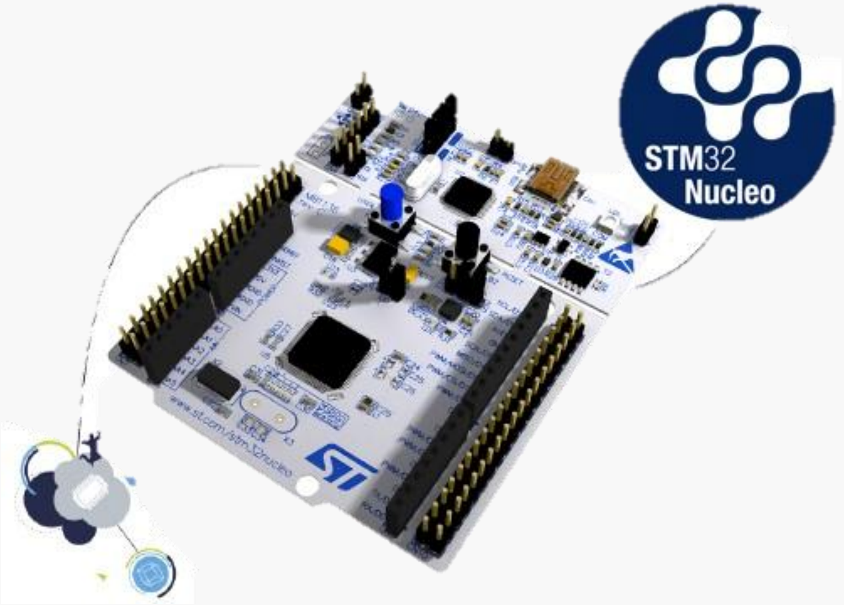
ChibiOS

Free RTOS

TI RTOS

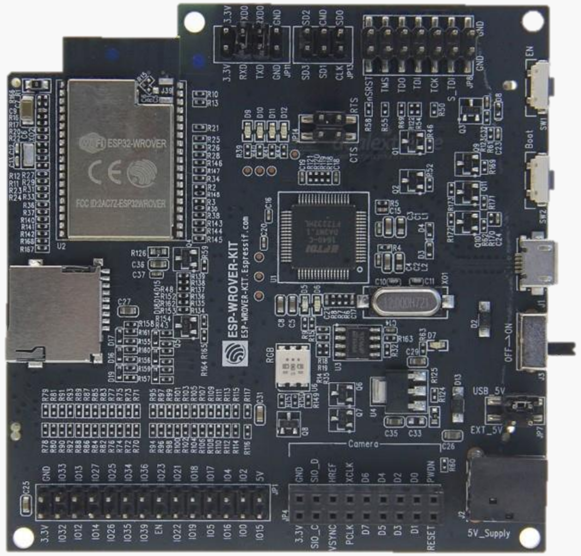
Azure RTOS

.NET nanoFramework Reference Targets



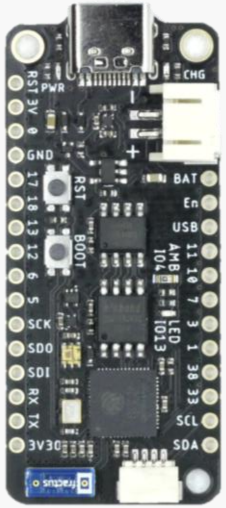
ST Microelectronics (STM32F0/F4/F7/L4/H7 series)

.NET nanoFramework Reference Targets



ESP32 WROVER KIT

ESP32 DEVKIT-C



FEATHER S2

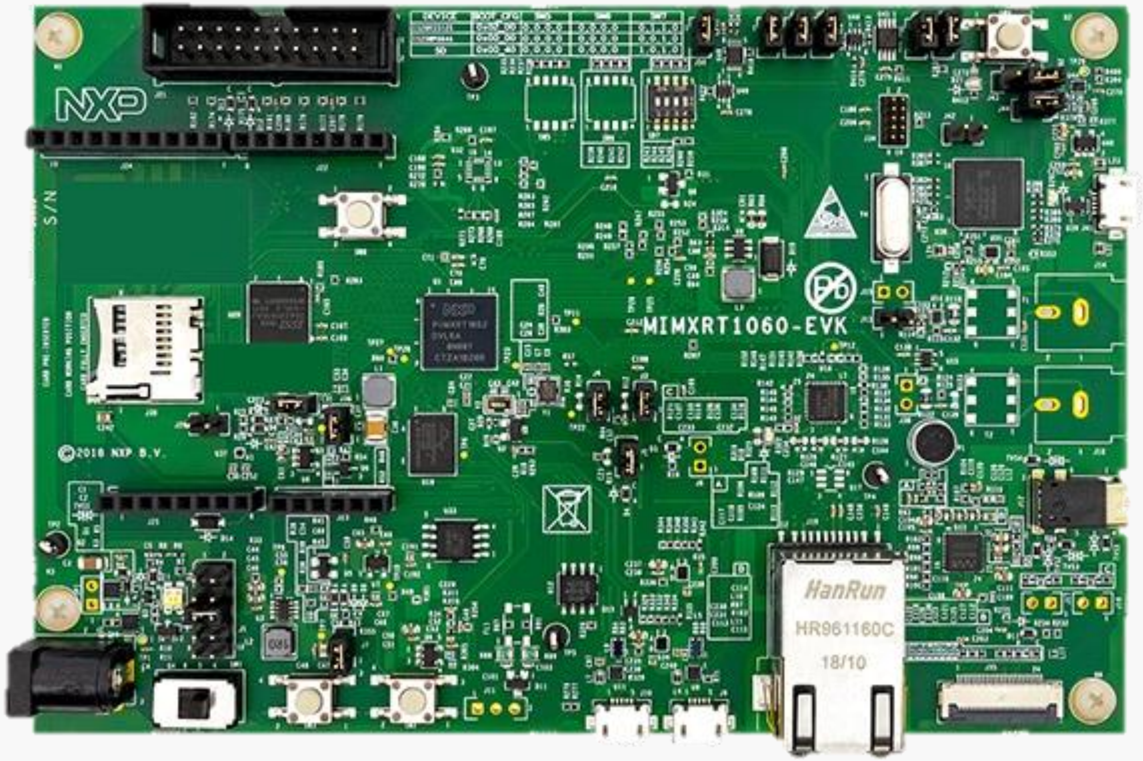
M5STACK

.NET nanoFramework Reference Targets

TI CC3220

TI CC1352R/P

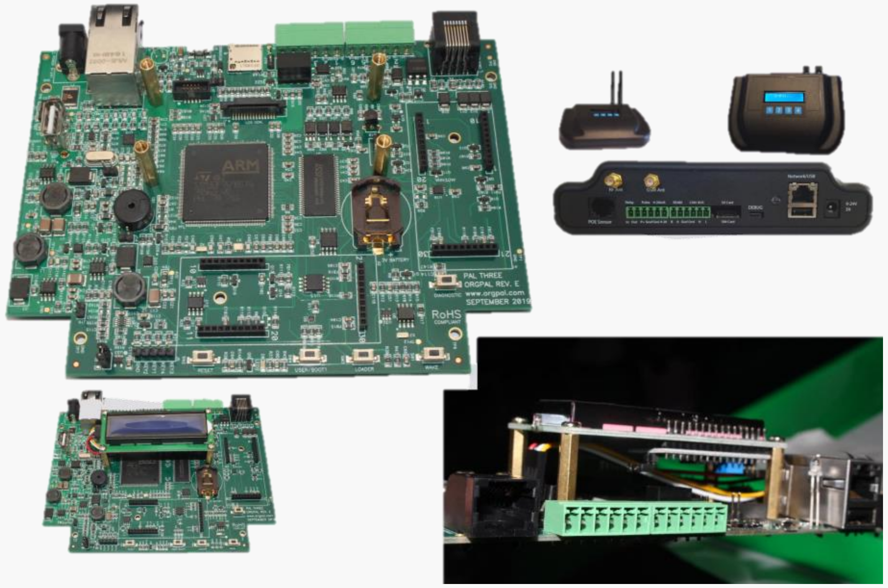
.NET nanoFramework Reference Targets



NXP MIMXRT1060-EVK

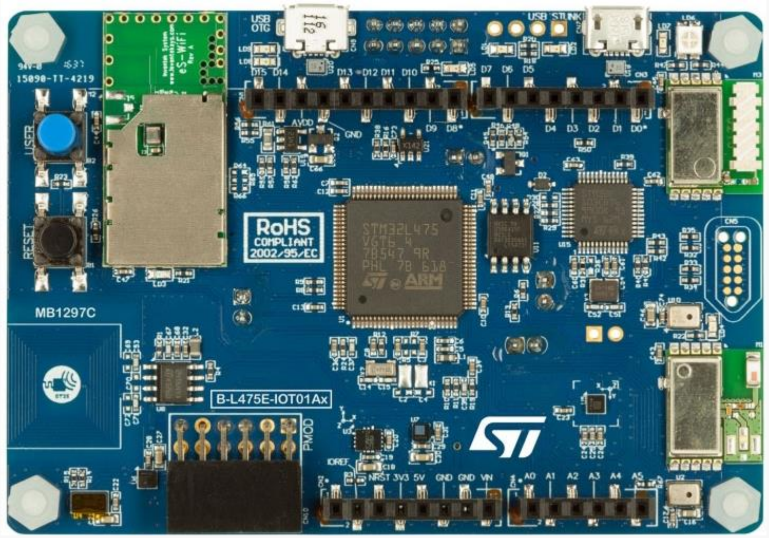
.NET nanoFramework Reference Targets

NETDUINO3

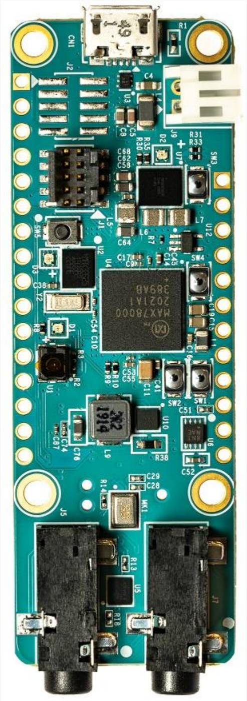


OrgPal PALTHREE

.NET nanoFramework Targets (work in progress)



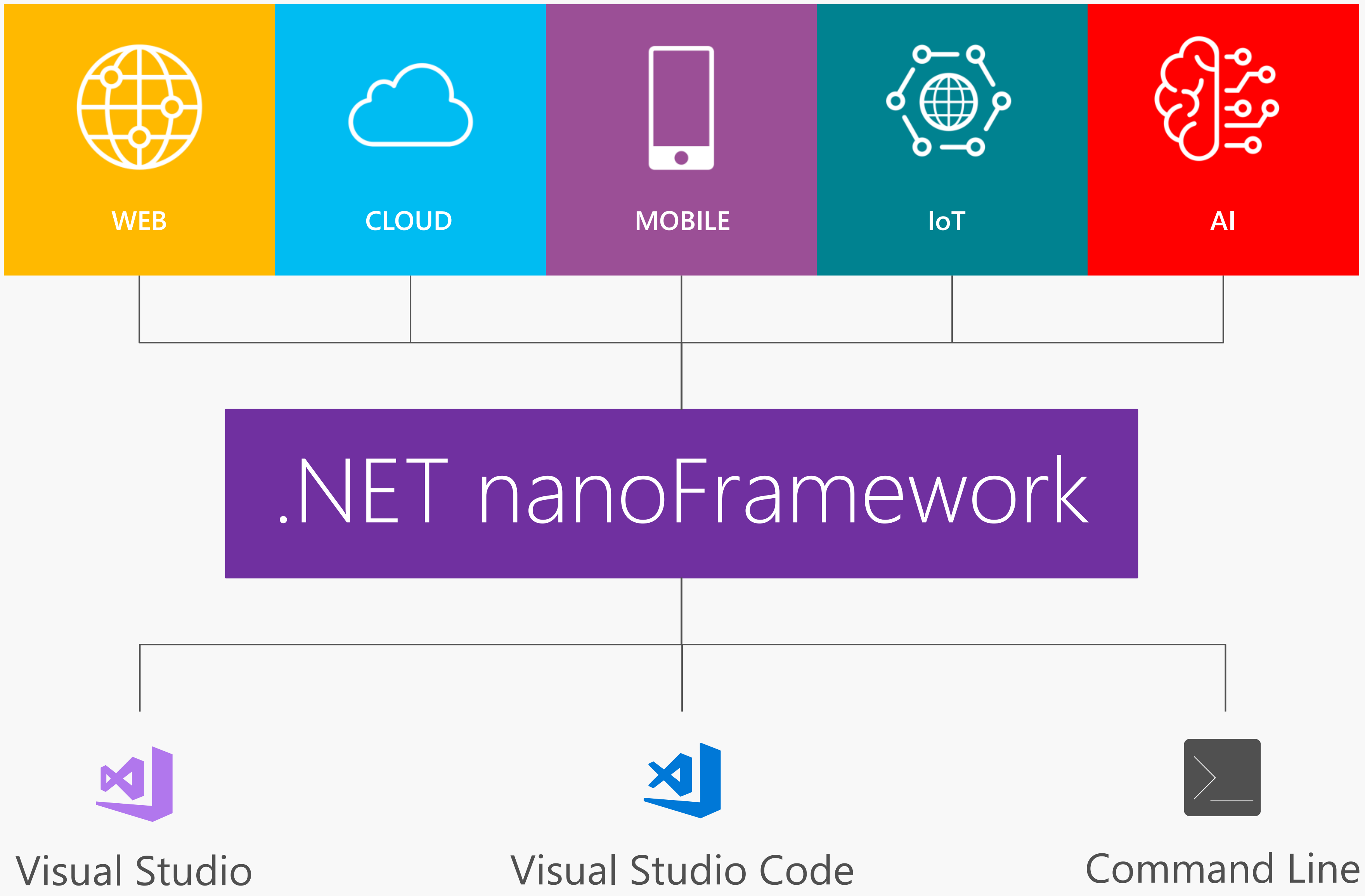
ST BL475EIOT01A



MAX78000

RPI PICO

Your platform for building (almost) **anything**



WEB

CLOUD

MOBILE

IoT

AI

.NET nanoFramework

Visual Studio

Visual Studio Code

Command Line

Ready to use libraries

NuGet
Conveniently available and distributed

Extensible
Standard .NET API, easy to use and extend, allowing code reuse

Open source
Developed in the open on GitHub

Build what you need
Components available to match what you need

SPI

Network

UART

1-Wire

GPIO

I2C

File IO

ADC

RegEx

Wi-Fi

PWM

Json

CAN

SignalR

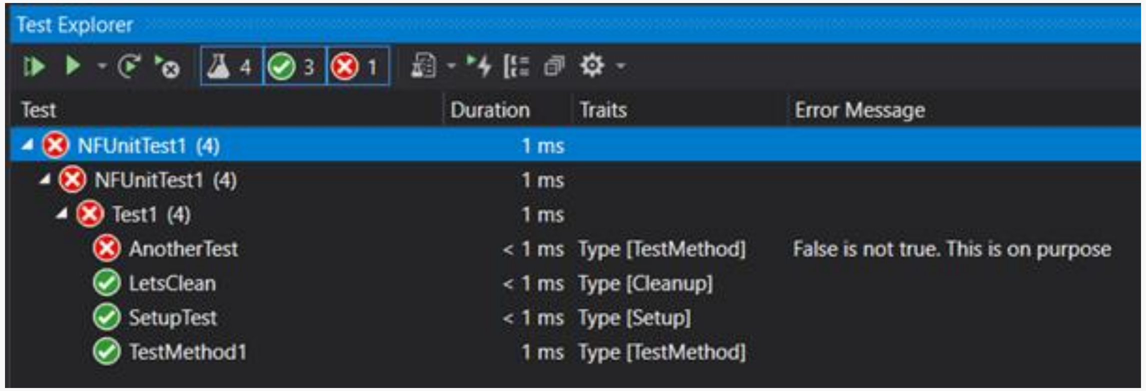
AMQP

HTTP(s)

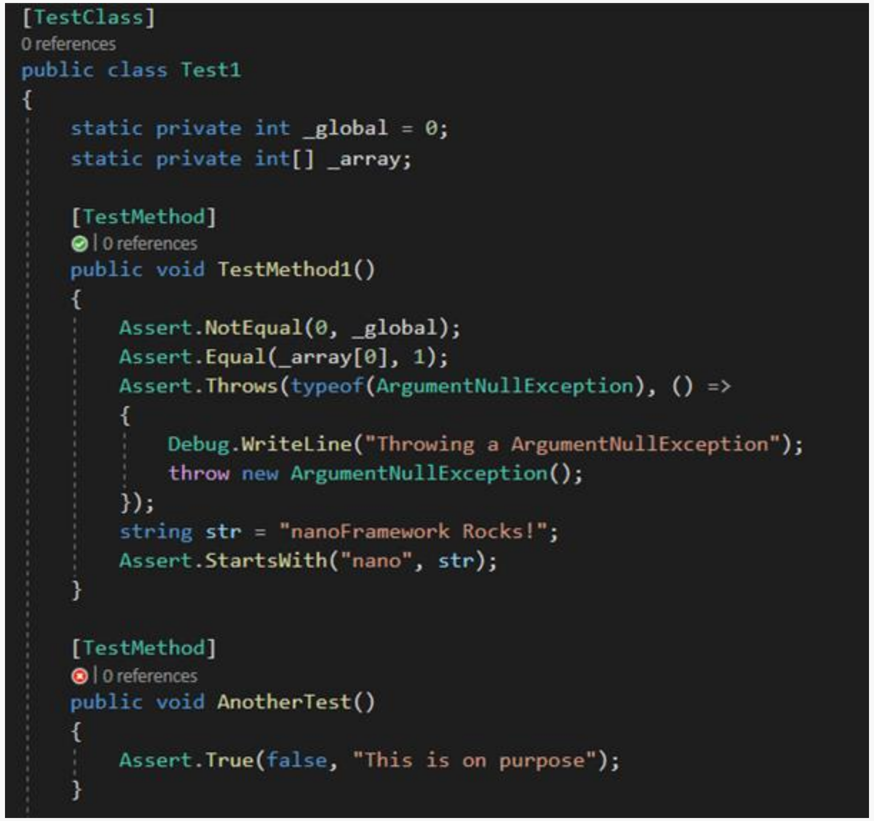
MQTT

Unit Test framework

- Standard Visual Studio test adapter
- Test discovery and executor
- Runnable in WIN32 image or directly on hardware



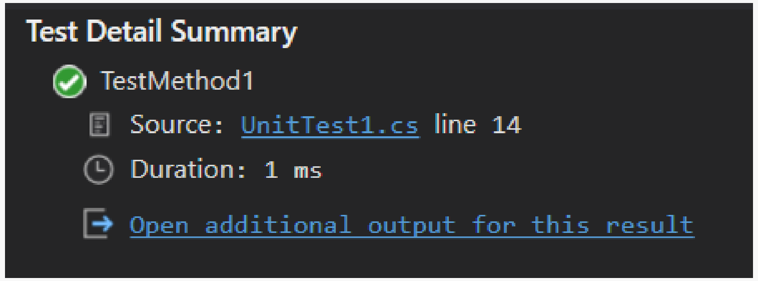
Test	Duration	Traits	Error Message
✗ NFUnitTest1 (4)	1 ms		
✗ NFUnitTest1 (4)	1 ms		
✗ Test1 (4)	1 ms		
✗ AnotherTest	< 1 ms	Type [TestMethod]	False is not true. This is on purpose
✓ LetsClean	< 1 ms	Type [Cleanup]	
✓ SetupTest	< 1 ms	Type [Setup]	
✓ TestMethod1	1 ms	Type [TestMethod]	



```
[TestClass]
0 references
public class Test1
{
    static private int _global = 0;
    static private int[] _array;

    [TestMethod]
    ✓ | 0 references
    public void TestMethod1()
    {
        Assert.NotEqual(0, _global);
        Assert.Equal(_array[0], 1);
        Assert.Throws(typeof(ArgumentNullException), () =>
        {
            Debug.WriteLine("Throwing a ArgumentNullException");
            throw new ArgumentNullException();
        });
        string str = "nanoFramework Rocks!";
        Assert.StartsWith("nano", str);
    }

    [TestMethod]
    ✗ | 0 references
    public void AnotherTest()
    {
        Assert.True(false, "This is on purpose");
    }
```



Test Detail Summary

✓ TestMethod1

Source: UnitTest1.cs line 14

Duration: 1 ms

Open additional output for this result

Demo:
Unit Tests

.NET

Thank you!

.NET

nano FRAMEWORK

nanoframework.net

github.com/nanoframework