Introduction to group

- UiPath batch 2 -> RPA (Robotic Process Automation)
  - Week 1-4
    - .Net
    - C#
    - SQL
    - Asp.Net (MVC, SOAP, RESTful)
    - Front End (HTML, CSS, JS, VB)
  - Week 5-8
    - UiPath Foundation -> Studio
    - UiPath Advanced -> ReFramework and Orchectrator
    - UiPath New features and advanced training -> Hyperautomation and ELK
  - Week 9-10
    - P3, Portfolios, Client Interviews, and showcase
- Training Operations
  - Evaluations
    - Quizzes
      - small ones daily[5-10 questions]
      - big ones [60 questions 45 minutes] on Mondays
    - 1 on 1s on Mondays
    - QC on Mondays
    - panels - week 9
  - Projects:
    - P0 - individual project covers C#
    - P1- individual project covers C# and SQL
    - P2- group project
    - P3- batch project working in groups

.NET Architectural Components

.NET Core

.Net => Platform => to create apps (CUI, GUI, microservices, cloud services, IOT, game development, ML)
2002 -> .Net framework 1.0
2020 -> .Net

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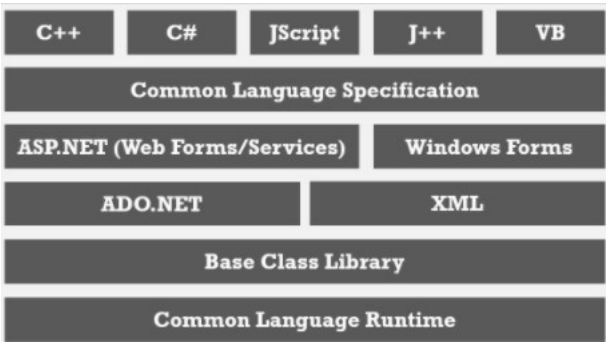
Framework (Windows)	Core (2016) platform independent	Xamarin Phone Apps	Mono (MacOS)

- .NET Standard
  - specification of .NET APIs to make up a uniform set of contracts to compile code against
  - enables use across different .NET implementations allowing the code to run everywhere
  - target framework
    - if code targets a version of Standard it can run on any .NET implementations supporting that

version

- versions are additive all APIs from previous versions are incorporated by later versions
- versions are immutable
- reference assemblies distributed with NuGet packages
- NETStandard.Library metapackage references complete set of NuGet packages defining .NET Standard



- bottom up
  - Common Language Runtime (CLR) handles code execution
  - Base Class Library contains "runtime libraries" supporting common functions such as:
    - file reading and writing
    - XML document manipulation
    - exception handling
    - application globalization
    - network communication
    - threading and reflection
  - ADO.NET (library) and XML support tasks related to data access, parsing, manipulation, and generating XML
  - ASP.NET and Windows forms build robust web applications and standard Windows applications as well as develop and consume web services
  - Common Language Specification (CLS) facilitates interoperability between languages
    - defines reasonable subset of Common Type System (CTS)
    - shared data type serving as great role in cross-language integration
    - flexibility makes many languages adapt to .NET platform
- .NET Core
  - since 2016 cross-platform implementation of .NET
  - designed to handle server and cloud workloads at scale
  - Components of .Net Core SDK
    - dotnet CLI (Common Language Infrastructure)
    - dotnet libraries (standard libraries)
    - runtime/Common Language Runtime (CLR)
- UWP - Universal Windows Platform
  - implementation of .NET used for building, touch-enabled Windows apps and software
  - designed to unify different devices
  - provides

        - centralized app store
        - execution environment (AppContainer)
        - set of Windows APIs
    - apps can be written in C++, C#, Visual Basic, and JavaScript
- .NET Runtimes
    - runtime is execution environment for managed program
    - examples include:
        - Common Language Runtime (CLR) for .NET Framework
        - Core Common Language Runtime (CoreCLR) for .NETCore
        - .NET Native for Universal Windows Platform
        - Mono runtime for Xamarin.iOS, Xamarin.Android, Xamarin.Mac, and Mono desktop framework
- ASP.NET Core
    - cross-platform, high-performance, open-source framework to build modern, cloud-based, internet connected applications
    - Benefits
        - integrated testing
        - develop and run on Windows, macOS, and Linux
        - support for hosting Remote Procedure Call (RPC) services using gRPC
        - cloud-ready, environment-based configuration system
        - build-in dependency injection
        - lightweight, modular HTTP request pipeline
        - ability to host on Docker, IIS, Kestrel and others
        - integrates with client-side frameworks and libraries

Common Language Runtime (CLR)

- .NET Framework consists of CLR and .NET Framework class library
- CLR is foundation for .NET Framework
    - manages and runs code
    - provides services like memory management, remoting, type enforcement (through CTS), and security
- Benefits
    - crosss-language integration
    - cross-language exception handling
    - enhanced security
    - versioning and deployment support
    - simplified model for component interaction
    - debugging and profiling services
- .NET Class Libraries
    - BCL (Base Class Library)
        - foundation for C# runtime library and one of the CLI standard libraries
        - provides types that represent built-in CLI data types, basic file access, collections, custom attributes, formatting, security attributes, I/O streams, string manipulation, etc.
    - class library
        - comprehensive, object-oriented collection of reusable types that can be used to develop apps
- .NET CoreFX

    - fork of BCL
    - foundational class library for .NET Core
    - defines types for primitives, collections, file systems, console, JSON, XML, async, etc.
    - makes up .NET Core BCL
- Managed Code
    - managed by CLR at runtime
    - CLR knows what code is doing and can manage it
    - CLR provides memory management (GC), security boundaries, type safety, etc.
    - written in high-level language that can be run on top of .NET
    - compiled into Intermediate Language code which CLR compiles and executes
    - manages Just-In-Time compiling of code from IL to machine code that can be run on a CPU
- Unmanaged Code
    - runs outside of CLR
    - .NET Framework promotes interaction with COM components, COM+ services, external type libraries, and many OS services
    - examples include: COM components, ActiveX interfaces, Windows API functions
- Indisposable Interface
    - Garbage Collector (GC) has no knowledge of unmanaged resources (open files and streams)
    - provides a method for releasing unmanaged resources
    - call IDisposable.Dispose implementation when finished using it
- Using Block
    - if language supports construct (like using statement in C#) can be used without explicitly calling IDisposable.Dispose
    - ensures .Dispose is called even if exception occurs within using block
    - can be achieved by putting object inside try block and calling .Dispose in finally block
    - block is expanded to try/catch block at compile time
- Using Block and IDisposable
    - provides convenient syntax ensuring correct use of IDisposable objects

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Anatomy of code (language compiler, runtime, platform)

- Procedural Programming
    - programming paradigm derived from "structured" programming based on concept of procedure call
    - procedures (routines, subroutines, functions, methods) contains series of computational steps to be carried out
    - methods can be called at any point in program's execution by other methods or by itself (recursion)
- C# Program Structure
    - key organizational concepts are programs, namespaces, types, members, and assemblies
    - consist of one or more source files
        - programs declare namespaces
        - namespaces contain types (classes/interfaces)
        - types contain members (Fields, methods, properties, events
    - Hello World program
        - starts with using directive referencing system namepace containing console class, I/O, Collections, and others
        - namespaces provide hierarchical means of organizing C# programs and libraries; contain types and

even other namespaces
    - using directive allows use of all type members of namespace
    - static method Main serves as entry point of program
- Generic Host
    - ASP.NET Core templates create .NET Core Generic Host (HostBuilder)
    - Host is object encapsulating apps resources (DI, Logging, Configuration)
        - allows lifetime management over app as it controls startup and shutdown
    - host calls IHostedService.StartAsync on each implementation of IHostedService in DI container
    - typically configured, build, and run by code in Program.cs
    - Main method:
        - calls CreateHostBuilder method to
            - create and configure a builder object
        - calls build and run methods on builder object
    - have default builder settings like:
        - setting content root to path returned by GetCurrentDirectory
        - enables scope validation and dependency validation where environment is development
- C# Structure
    - Data Types
        - 2 types of variable types are supported
            - Value Types
                - built-in primitive data types
                    - char, int, and float
                - along with user-defined tpes declared with struct
                - directly contain their data
            - Reference Types
                - classes and other complex data types constructed from primitive types
                - contain reference to location in memory where data is held
    - Expressions
        - constructed from operands and operators
        - operands are what operators act upon (literals, fields, local variables, expressions)
        - precedence of operators controls order in which individual operators evaluated
    - Statements
        - actions of any program are expressed using statements
        - C# uses various types
            - block: consists of list of statements written between {}
            - Declaration: used to create variables and constants
            - Expression: statements used to evaluate actions and take on values
                - includes method invocations, object allocations using new, compound assignment operators, and await expressions among others
            - Selection: statements used for "flow-control"
                - select one of possible statements for execution based on value (if and switch)
            - Iteration: statements include the while, do, for, and foreach statements; repeat until condition is met
            - Jump: statements used to transfer control; contains break, continue, goto, throw, return, and yield

- Methods
  - code block containing series of statements
  - program calls method and required arguments
  - all commands are executed within a method
  - Main method is entry point for applications
  - declared in class or struct by specifying method signiature:
    - access level and modifiers are optional
    - all signiatures must include return value, method name, and method parameters
- Method Invocation
  - 2 types
    - Instance methods: require object to be instantiated to be called
    - Static Methods: can be called without instantiating object
- Classes
  - most fundamental type
  - data structure combining state (fields) and actions (metods and other functions) in a single unit
  - provides template for instances of class known as objects
  - created by using class declarations
    - start with header specifying: attributes and modifiers, name, base class(if given), and interfaces implemented by class
    - header followed by body consisting of list of member declarations

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Common Language Infrastructure (CLI)

- part of .NET strategy enabling application program written in any programming language to be run on any operating system using a "common" runtime program rather than language-specific one
- Common Type System (CTS)
  - used by CLR to enforce strict typing and code verification
  - ensure all compilers generate managed code conforming to CTS
  - describes all data types and all related constructs supported by CLR
  - details how they must be represented in .NET metadata format
  - specifies how entities can interact with eachother
  - managed code can consume other managed types and instances while enforcing type fidelity and type safety
  - provides library of basic primitive types to be used in application development
    - defines 2 main types that should be supported (reference and value)
    - defines several categories of types each with specific semantics and usage
    - defines all other properties of types (access modifiers, valid type members, how inheritance, and overloading works, etc.)
  - Common Language Specification (CLS)
    - .NET has specified commonalities required to enable full interoperability between languages
    - subset of CTS so all rules apply
    - defines set of rules and restrictions every language must follow when running under .NET Framework
    - provides recipe for any language implemented on top of .NET on what it must support
- Common Intermediate Language (CIL)

- intermediate language binary instruction set defined within CLI
- instructions are executed by Common Language Runtime
- languages targetting CLI compile to CIL
- runtimes Just-In-Time(JIT) compile CIL instructions into native code
    - JIT (Just-In-Time Compiler)
        - involves compilation of program at runtime
        - assumes some code might never be called
        - converts CIL as needed during execution and stores resulting code in memory to make it accessible for subsequent calls in context of process instead of converting everything no matter what
    - VES (Virtual Execution System)
        - run-time system of CLI providing environment for executing managed code where CIL instruction set can be executed
        - CLR is .NET Framework's implementation of a VES providing direct support for set of data types
        - defines:
            - hypothetical machine with associated machine model and state
            - set of control flow constructs
            - exception handling model

Git Essentials

- Version Control System
    - software/system that allows management of changes/developments made in coding project
- Git
    - version control system (specifically distributed version control system DVCS)
    - records changes made to project and maintains history tree with state of project at savepoint
- Repository
    - where code is stored
        - local is on your machine
        - remote is online (GitHub)
- Commit
    - version of code
    - how you create save points that you can access and be able to revert back if something goes wrong
- Branch
    - separate lines of development
    - good to have at least 2 branches where main has latest stable version and feature branches that can be merged with master branch once they work
- Staging
    - used to group files you choose to include in commit
    - if changes don't work you can revert to last code that worked
- Basic Git Commands
    - git init
        - initializes git repository in folder
        - creates empty git repo
    - git clone <link to remote repo>

        - creates local clone of remote repo
    - git add filename/.
        - adds file or files to staging
    - git status
        - checks what files are in staging
        - displays state of working directory and staging area
    - git commit -m 'message'
        - commits changes to repository
        - must include 'message'
    - git push
        - pushes changes to remote repository
    - git pull
        - used to get updates on changes made to remote depository being tracked
- .gitignore
    - important file in repository
    - lists all files to be ignored (not tracked), files would be pushed to remote repository
    - commonly build output