Hidden Secrets of the PowerShell Masters

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Announcements!

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Enums

Comfortably Enum?

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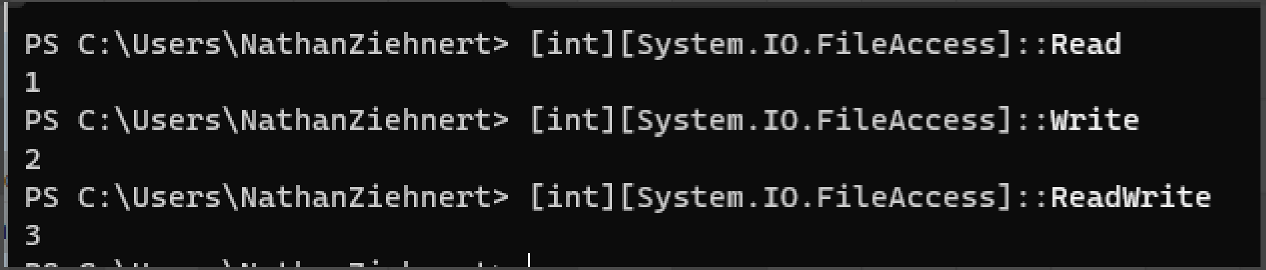
Enum(eration)s

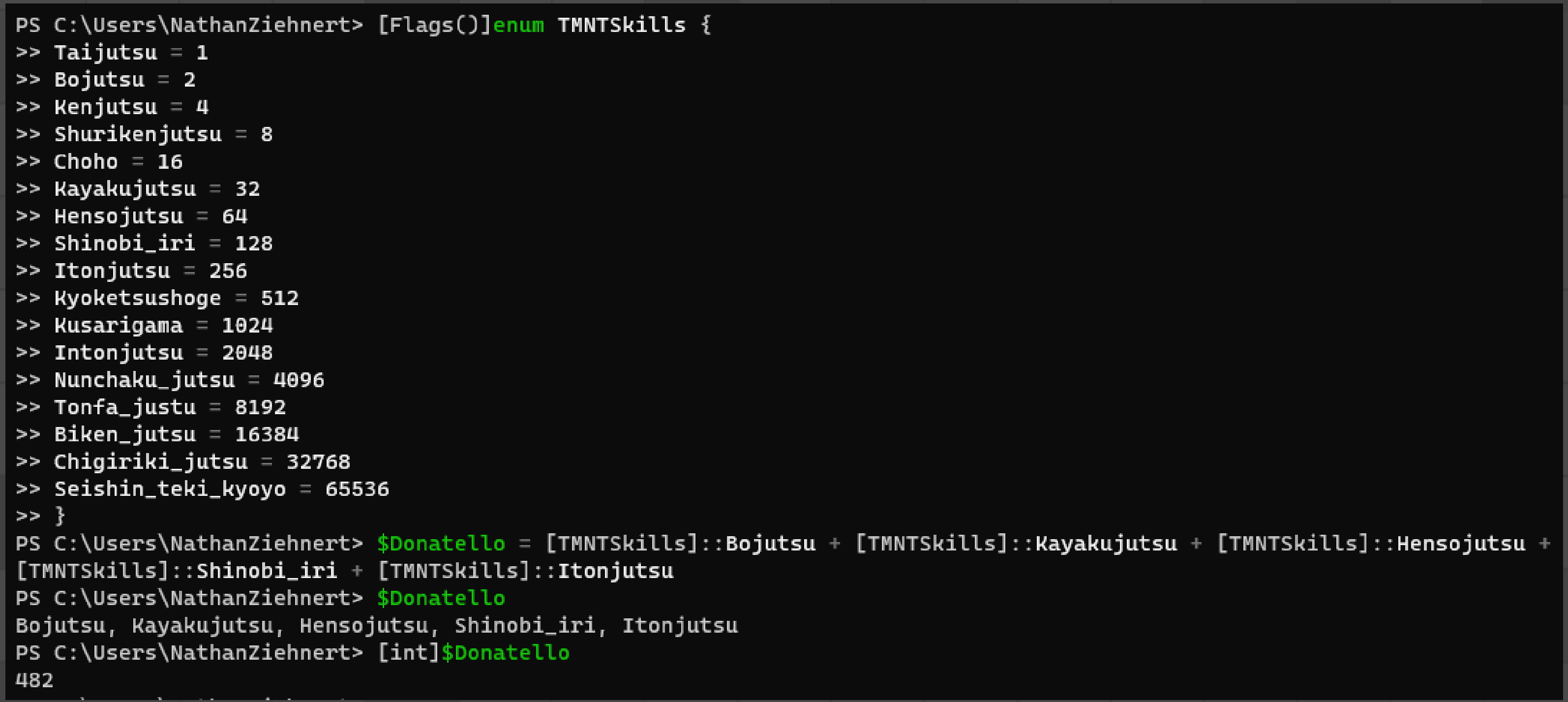
- Named labels (think strings) given an integer value
- Allow you to forget numbers and remember words
  - FileAccess Enum:
    - Read = 1
    - Write = 2
    - ReadWrite = 3



```
PS C:\Users\NathanZiehnert> [int][System.IO.FileAccess]::Read
1
PS C:\Users\NathanZiehnert> [int][System.IO.FileAccess]::Write
2
PS C:\Users\NathanZiehnert> [int][System.IO.FileAccess]::ReadWrite
3
```

Flags

- A definition to add to an enumeration
- Think of them like light switches…
- Should be Powers of 2, to work properly



```
PS C:\Users\NathanZiehnert> [Flags()]enum TMNTSkills {
>> Taijutsu = 1
>> Bojutsu = 2
>> Kenjutsu = 4
>> Shurikenjutsu = 8
>> Choho = 16
>> Kayakujutsu = 32
>> Hensojutsu = 64
>> Shinobi_iri = 128
>> Itonjutsu = 256
>> Kyoketsushoge = 512
>> Kusarigama = 1024
>> Intonjutsu = 2048
>> Nunchaku_jutsu = 4096
>> Tonfa_justu = 8192
>> Biken_jutsu = 16384
>> Chigiriki_jutsu = 32768
>> Seishin_teki_kyoyo = 65536
>> }
PS C:\Users\NathanZiehnert> $Donatello = [TMNTSkills]::Bojutsu + [TMNTSkills]::Kayakujutsu + [TMNTSkills]::Hensojutsu +
[TMNTSkills]::Shinobi_iri + [TMNTSkills]::Itonjutsu
PS C:\Users\NathanZiehnert> $Donatello
Bojutsu, Kayakujutsu, Hensojutsu, Shinobi_iri, Itonjutsu
PS C:\Users\NathanZiehnert> [int]$Donatello
482
```

Enums Demo

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Why The Masters Use This

Especially helpful for putting words to numbers

Settings/Property Flags

If you've used WMI or the PowerShell Module for ConfigMgr

Flags… flags everywhere…

Classes

I thought we were done with school…

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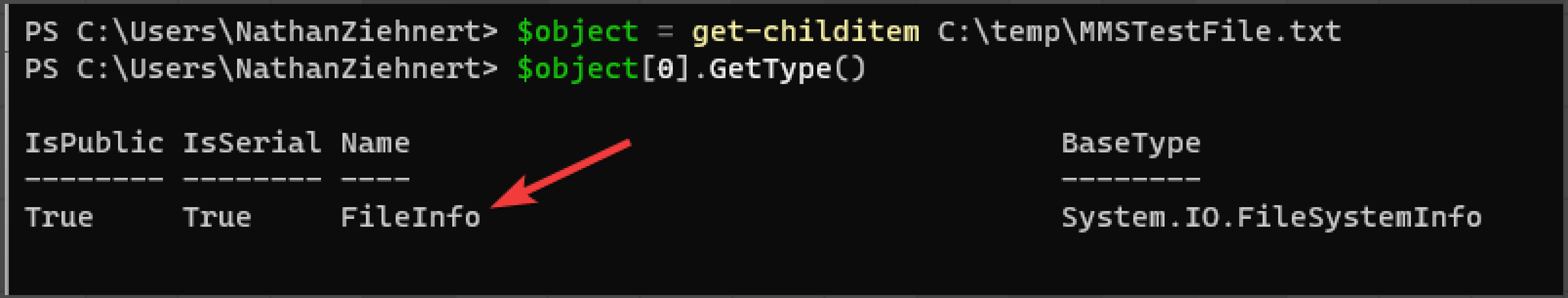
Classes

- Fundamental Concept in Object-Oriented Programming
- Object Blueprints
- You already use them! Now you can make them…
  - Example: Get-ChildItem (for files) returns a `FileInfo` class instance



```
PS C:\Users\NathanZiehnert> $object = get-childitem C:\temp\MMSTestFile.txt
PS C:\Users\NathanZiehnert> $object[0].GetType()

IsPublic IsSerial Name                                     BaseType
-------- -------- ----                                     --------
True     True     FileInfo                                 System.IO.FileSystemInfo
```

- PSCustomObject is your baby step into this world…

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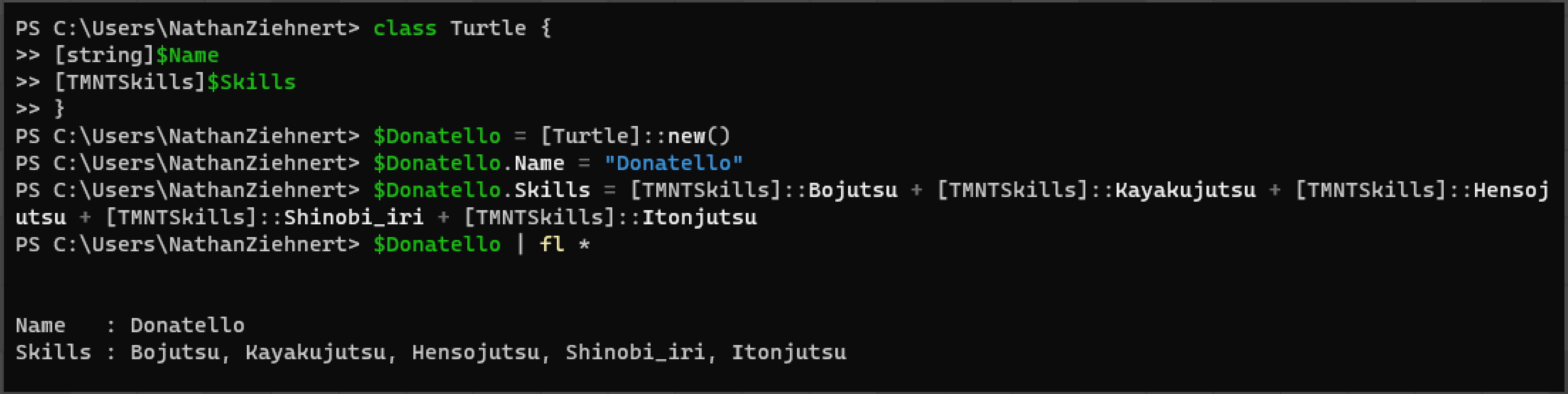
Properties/Attributes

- Variables assigned to the class
- Can be primitives (string, int, etc.), enums, or even other classes
- Allows you to describe something about your object



```
PS C:\Users\NathanZiehnert> class Turtle {
>> [string]$Name
>> [TMNTSkills]$Skills
>> }
PS C:\Users\NathanZiehnert> $Donatello = [Turtle]::new()
PS C:\Users\NathanZiehnert> $Donatello.Name = "Donatello"
PS C:\Users\NathanZiehnert> $Donatello.Skills = [TMNTSkills]::Bojutsu + [TMNTSkills]::Kayakujutsu + [TMNTSkills]::Hensoj
utsu + [TMNTSkills]::Shinobi_iri + [TMNTSkills]::Itonjutsu
PS C:\Users\NathanZiehnert> $Donatello | fl *


Name   : Donatello
Skills : Bojutsu, Kayakujutsu, Hensojutsu, Shinobi_iri, Itonjutsu
```

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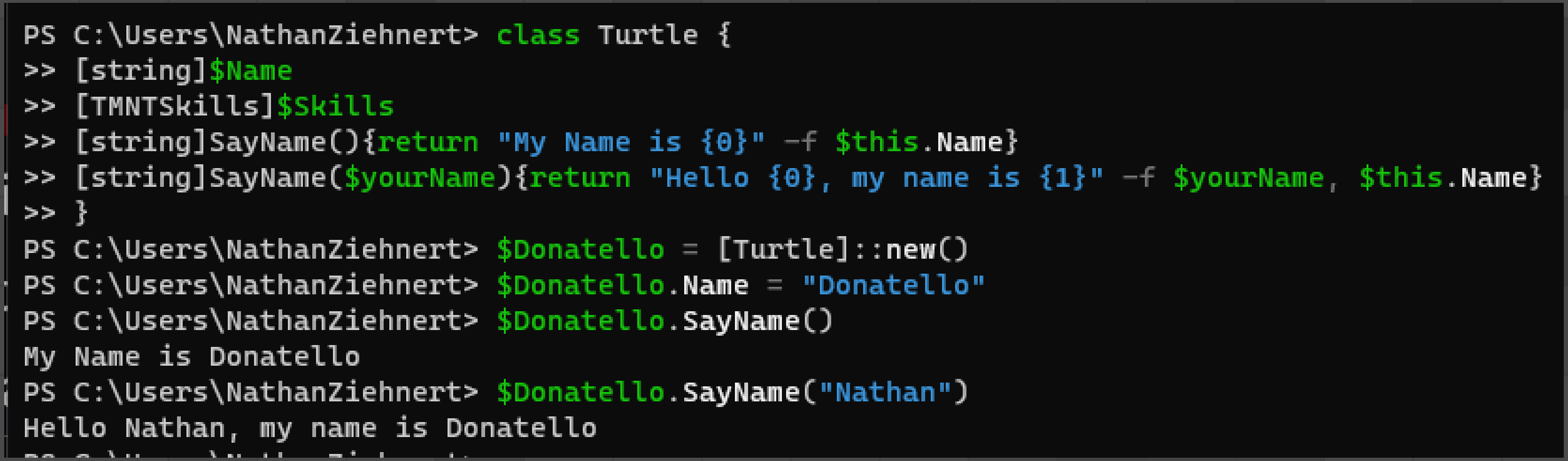
Methods

- They're like functions… sort of
- Can take parameters, can return data…
- Supports "Overloading"



```
PS C:\Users\NathanZiehnert> class Turtle {
>> [string]$Name
>> [TMNTSkills]$Skills
>> [string]SayName(){return "My Name is {0}" -f $this.Name}
>> [string]SayName($yourName){return "Hello {0}, my name is {1}" -f $yourName, $this.Name}
>> }
PS C:\Users\NathanZiehnert> $Donatello = [Turtle]::new()
PS C:\Users\NathanZiehnert> $Donatello.Name = "Donatello"
PS C:\Users\NathanZiehnert> $Donatello.SayName()
My Name is Donatello
PS C:\Users\NathanZiehnert> $Donatello.SayName("Nathan")
Hello Nathan, my name is Donatello
```

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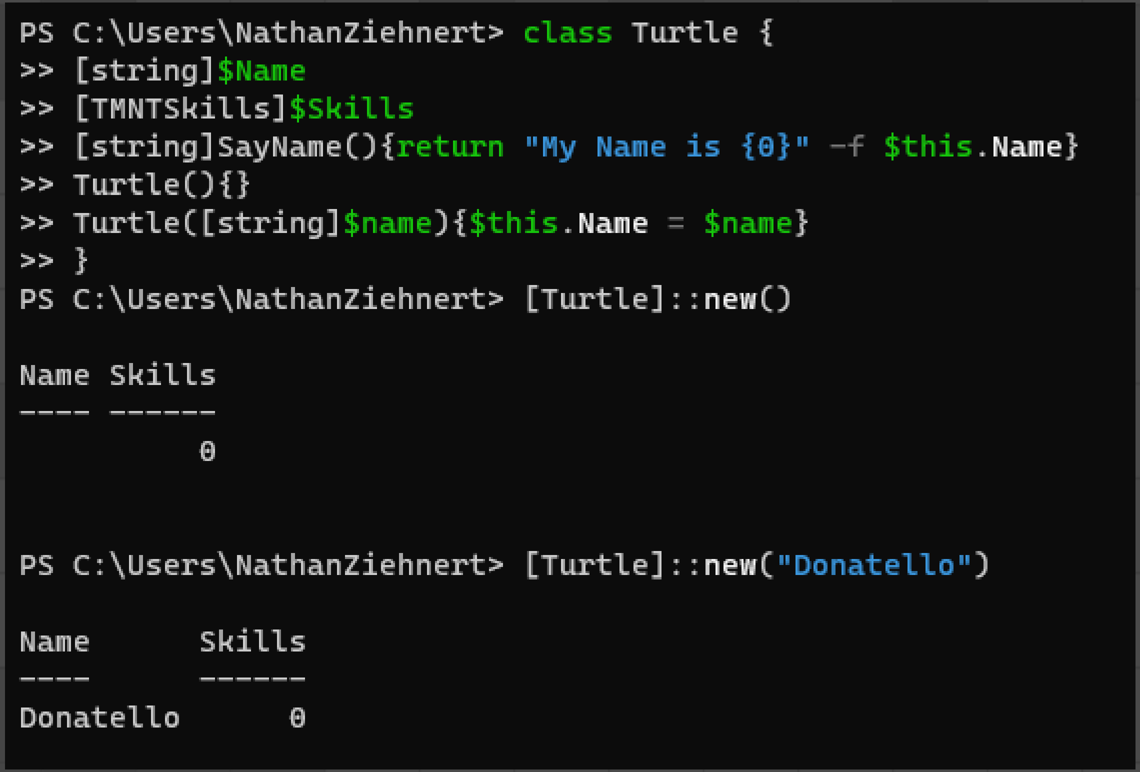
Constructors

- Set / Validate objects on creation
- Same name as class
- Zero or more allowed… i.e. supports overloading



```
PS C:\Users\NathanZiehnert> class Turtle {
>> [string]$Name
>> [TMNTSkills]$Skills
>> [string]SayName(){return "My Name is {0}" -f $this.Name}
>> Turtle(){}
>> Turtle([string]$name){$this.Name = $name}
>> }
PS C:\Users\NathanZiehnert> [Turtle]::new()

Name Skills
---- ------
          0


PS C:\Users\NathanZiehnert> [Turtle]::new("Donatello")

Name      Skills
----      ------
Donatello      0
```

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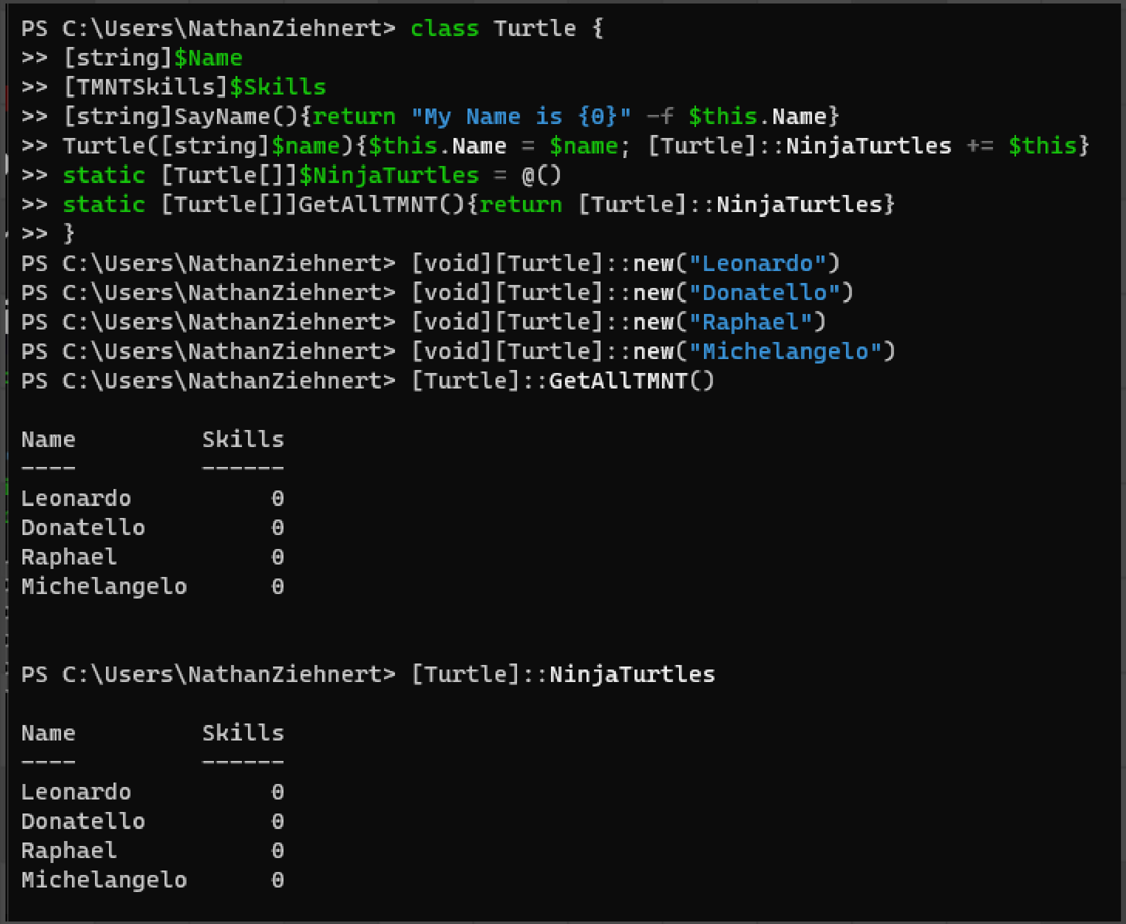
Statics

- Attribute for properties and methods
- Exists as part of the class, not an instance of the class
- Shared across all instances of the class



```
PS C:\Users\NathanZiehnert> class Turtle {
>> [string]$Name
>> [TMNTSkills]$Skills
>> [string]SayName(){return "My Name is {0}" -f $this.Name}
>> Turtle([string]$name){$this.Name = $name; [Turtle]::NinjaTurtles += $this}
>> static [Turtle[]]$NinjaTurtles = @()
>> static [Turtle[]]GetAllTMNT(){return [Turtle]::NinjaTurtles}
>> }
PS C:\Users\NathanZiehnert> [void][Turtle]::new("Leonardo")
PS C:\Users\NathanZiehnert> [void][Turtle]::new("Donatello")
PS C:\Users\NathanZiehnert> [void][Turtle]::new("Raphael")
PS C:\Users\NathanZiehnert> [void][Turtle]::new("Michelangelo")
PS C:\Users\NathanZiehnert> [Turtle]::GetAllTMNT()

Name         Skills
----         ------
Leonardo          0
Donatello         0
Raphael           0
Michelangelo      0


PS C:\Users\NathanZiehnert> [Turtle]::NinjaTurtles

Name         Skills
----         ------
Leonardo          0
Donatello         0
Raphael           0
Michelangelo      0
```

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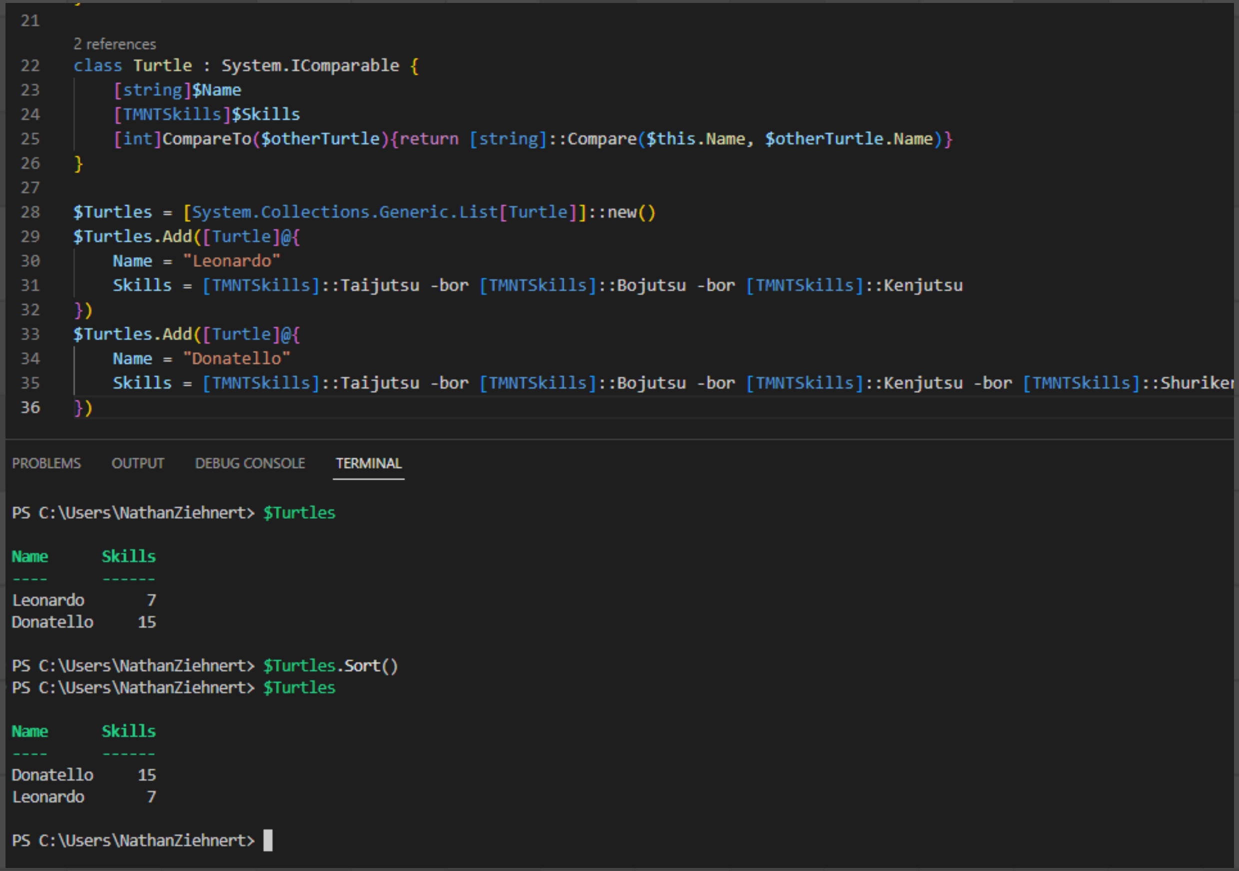
Inheritance (Base / Interface)

- Extending classes
  - Inherit Base properties/methods
  - Fulfill a contract (Interface)
- You can implement .NET Interfaces (like IComparable)



```
2 references
class Turtle : System.IComparable {
    [string]$Name
    [TMNTSkills]$Skills
    [int]CompareTo($otherTurtle){return [string]::Compare($this.Name, $otherTurtle.Name)}
}

$Turtles = [System.Collections.Generic.List[Turtle]]::new()
$Turtles.Add([Turtle]@{
    Name = "Leonardo"
    Skills = [TMNTSkills]::Taijutsu -bor [TMNTSkills]::Bojutsu -bor [TMNTSkills]::Kenjutsu
})
$Turtles.Add([Turtle]@{
    Name = "Donatello"
    Skills = [TMNTSkills]::Taijutsu -bor [TMNTSkills]::Bojutsu -bor [TMNTSkills]::Kenjutsu -bor [TMNTSkills]::Shurike
})
```

```
PS C:\Users\NathanZiehnert> $Turtles

Name      Skills
----      ------
Leonardo       7
Donatello     15

PS C:\Users\NathanZiehnert> $Turtles.Sort()
PS C:\Users\NathanZiehnert> $Turtles

Name      Skills
----      ------
Donatello     15
Leonardo       7

PS C:\Users\NathanZiehnert>
```

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Classes Demo

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Why The Masters Use This

- Organize your data better!
- Fun with Statics (Methods and Attributes)
- Implementing helpful .NET Interfaces (IComparable)

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.NET Namespaces Classes and Methods

More classes?

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Docs, Docs, Docs!

- .NET
  https://learn.microsoft.com/en-us/dotnet/api/?view=net-7.0
- .NET Framework
  https://learn.microsoft.com/en-us/dotnet/api/?view=netframework-4.8.1

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.NET 7 vs .NET Framework

- Is there a difference? Yes.
- Will it affect you? Probably not.
    - Windows specific items…
    - dotnet can likely load .NET Framework libraries*… the reverse is not true…

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Nuget Packages

- When you want something special…
  it actually probably exists in .NET already…
- For those rare exceptions where it doesn’t, there’s Nuget.org
- How To: Reference It
  `Add-Type -Path("c:\path\to\thingy.dll")`
- Cross-compatibility (pswh/PowerShell)?

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How To Use Them!

- The same way you use PowerShell classes!
- Instance Constructors
  `[Namespace.Namespace.Namespace.Class]::new()`
- Static Methods
  `[Namespace.Namespace.Namespace.Class]::method()`
- Fields/Constants/Enum
  `[Namespace.Namespace.Namespace.Class]::Field`

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Using Namespace

- Tired:

```
$list = [System.Collections.Generic.List[int]]::new()
```

- Wired:

```
using namespace System.Collections.Generic
$list = [List[int]]::new()
$list2 = [List[string]]::new()
```

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Crawl (Math)

- [System.Math] https://learn.microsoft.com/en-us/dotnet/api/system.math.sign?view=net-7.0
- Fields
  - E
  - Pi
  - Tau
- Methods
  - Round
  - Floor/Ceiling
  - Min/Max

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Math Examples

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Walk (Array Replacements)

- [System.Collections.XXXXXX]
  https://learn.microsoft.com/dotnet/api/system.collections?view=net-7.0
  - Queue (FIFO)
  - Stack (LIFO)
  - ArrayList (NO! BAD! NO!)
- [System.Collections.Generic.XXXXXX[_____]]
  - Queue (FIFO)
  - Stack (LIFO)
  - List

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Collection Examples

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Run (System.IO.File)

- For very large files… you might see a performance increase
- If you need to read bytes instead of strings
  - [System.IO.File]::ReadAllBytes("c:\path\to\file.exe")
- Also works with text, although maybe no measurable difference
  - [System.IO.File]::ReadAllLines("c:\path\to\text.txt")

System.IO.File Example

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Why The Masters Use This

- Unlock some serious new potential
- Some things are better than what is “built-in” (List vs. Array)
- Some things might be faster than what is “built-in” (System.File.IO)

P/Invoke

Pee What?

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P/invoke – Turtle Power!

- What is it?
  - Calling code that is stored in a DLL
  - “Unmanaged” code
- What can it do?
  - Everything!
- Why?
  - Need to use a third-party DLL
  - Need to use a WinAPI
- Quick Deep Dive…

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P/Invoke Demo

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Why The Masters Use This

- Use libraries from other programming languages
- Supported Control over the OS
- Performance

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Advanced Troubleshooting

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Try/Catch/Finally

- Try
  - Run this block of code, and see if there is an error
- Catch
  - If a terminating error is encountered, run this script block to handle the error
- Finally
  - Runs after try/catch to cleanup anything that might have been created during try/catch

- You can “catch” specific errors – so you could handle different exceptions differently

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Try/Catch/Finally

```
Try {
  ThisDoesntExistAndWillFail
  New-Item C:\Test.txt -Force
}
Catch {
  Write-Output "Huh... Guess that function doesn’t exist"
}
Finally {
  if(Test-Path C:\Test.txt) {
    Remove-Item C:\Test.txt -Force
  }
}
```

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Try/Catch/Finally Demo

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Wait-Debugger

- Sort of like a nested prompt
- But actually a Debugger!
    - Step in/over/out
    - Continue/quit

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Trap

- A script block to run when encountering unhandled terminating errors
- Like "catch" you can handle SPECIFIC errors
- FIFW – First In, First Win…
- Nice to combine with Wait-Debugger

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Trap

```
Trap {
  Write-Host "!!!!!" -Foreground Red
  Write-Host "Error Encountered" -Foreground Red
  Write-Host $_ -Foreground Red
  Write-Host "!!!!!" -Foreground Red
  Wait-Debugger
}
ThisFunctionDoesntExist
```

Trap Demo

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Why The Masters Use This

- Nobody’s code is perfect
- Troubleshooting scripts without an ISE
- Handling !expected! errors

Questions?

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