WolfTech Active Directory: PowerShell

March 7th, 2012

2-4pm Daniels 201

http://activedirectory.ncsu.edu

What we are going to cover...

- Powershell Basics
- Listing Properties and Methods of Commandlets
- .Net Libraries
- Available Modules
- Securing Powershell Scripting
- Regular Expressions
- Powershell ActiveDirectory Module
- PSRemoting
- Server Administration - Roles

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Core Cmdlets

- A PowerShell cmdlet is a pre-compiled command that can be invoked by the PowerShell runtime.
- There are many that come built-in to the runtime and many more can be loaded into the environment
- Cmdlets have a Verb-Noun naming convention

Get-Command	Get-Help	Sort-Object
Select-Object	Compare-Object	Where-Object
Get-WmiObject	Get-WinEvent	Get-EventLog
Group-Object	Import-CSV	Export-CSV
Format-Table	Format-List	

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Getting Help

- Get-Help <Command>
  - -detailed displays more detailed help
  - -examples will display usage examples
  - -full displays everything, including detailed help, per-parameter help, and usage examples
- About pages
  - Get-Help about_<topic>
  - About pages exist at C:\Windows\System32\WindowsPowerShell\v1.0\en-US
- To find commands issue the Get-Command commandlet
  - Get-Command get-* Get-Command remove-*
  - Get-Command set-* Get-Command *
  - Get-Command * | where {$_.CommandType -eq "cmdlet"}
- Get-Help alias is help

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Variables

- The special '$' character is used to notify the shell of a variable
- Variables can contain text, objects, integers, or a collection of objects.
- Variables are stored in the PSDrive 'Variable'
- Cmdlets available for managing variables
  - New-Variable
  - Remove-Variable
  - Set-Variable
  - Get-Variable
  - Clear-Variable
  - Dir Variable
- Piped variables pipe their content
- Piped arrays refer to the current object using $_
- Powershell will attempt to convert (coerce) objects into the necessary type
- You can inform Powershell of type using square brackets

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Variable Examples

```
$var = 10
$process = Get-Process
```

```
$password = Read-Host -Prompt 'Enter Password' -AsSecureString

$wmi = gwmi Win32_OperatingSystem
$wmi.Caption
$wmi.Reboot()
```

```
[int]$value = '7'
[string]$value = 'Hello'
```

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Get-Member

- Shows you the members of an object that has been passed into it
- Shows the type name, the formal and unique name by which the object is known
- Can view nested objects
- Aliased to "gm"
- Can show you static methods and properties of classes

```
Get-Process | Get-Member
Get-Process | gm | where {$_.MemberType -eq "Property"}
Get-WmiObject Win32_OperatingSystem | gm | Out-GridView
[math] | Get-Member -Static
```

Operators, Pipelines, and Filtering

- Comparison Operators are used to evaluate "True" or "False"
- Powershell references each by $True and $False

4 < 14 is False
Boy = Girl is Fales
7 ≤ 7 is True

- Execute Powershell comparisons from the command line:

4 -lt 10 returns False
"Boy" -eq "Girl" returns False
7 -le 7 returns True

More Operators

- Common Operators

-eq	: Equal to
-ne	: Not equal to
-le	: Less than or equal to
-ge	: Greater than or equal to
-gt	: Greater than
-lt	: Less than
-like	: Uses wildcards for pattern matching
-notlike	: Negates the -like
-match	: Uses regular expressions for pattern matching
-notmatch	: Negates the -match
-contains	: Determine elements in a group. Evaluates to Boolean $True or $False
++, --	: Increment / decrement

Pipelines, and Filtering

- The Where-Object cmdlet removes objects from the pipeline based on specified criteria
- Where-Object uses $_ to represent the current pipelined object
- Where-Object is aliased as 'where'
- Using Where-Object can be computationally expensive due to the need to process each object

```
Get-Process | Out-GridView # Short list
Get-Process | Select-Object * | Out-Gridview # Long list

Get-Service | Where-Object { $_.Status -eq "Running"}
```

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Quotes, Brackets, and other Punctuation

- Single quotes is a literal string
  - ‘This costs $100’
- Double quotes is an evaluated string
  - $what = ‘$100’; “This costs $what”
- Back ticks used as the escape character
  - “This is `”quite`” a string”; “This is on `n two lines”
- Semicolon is the command separator
- Parentheses are for required parts of control structures and inline execution
  - if (<test1>) {<statement list 1>}
  - $page = (new-object system.net.webclient).DownloadString($url)
- Braces are for the block expressions in control structures
  - do {<statement list>} until (<condition>)
- Brackets are used for optional elements
  - [string]typing variables, $indices[0], regular expressions[a-z], and function parameters
- Double colon is used for calling external methods
  - [System.Math]::Round($Num, 2)
- Pound is a comment, <# ... #> is for block comments

Regular Expressions

- Powershell provides multiple operators for direct text manipulation
  - -replace
  - -join
  - -split
  - -match
- Powershell supports industry-standard (Perl) regex syntax to perform pattern matching on strings
- Use Select-String cmdlet to perform both simple and regular expression matches against text.
  - Analogous to 'grep' in UNIX

Powershell Providers

- Powershell Providers are .NET programs that provide data stores as if they were mounted drives
- Simplifies access to external data outside the Powershell environment
- Provides access to data that would not otherwise be easily accessible from the command line
- View available Providers with
  - Get-PSProvider
- Use PSDrive to mount Powershell Providers
  - Get-PSDrive

Profiles

- Profiles in Powershell provide a mechanism to customize the shell environment automatically with each new session
- Preload modules, custom aliases, connect PSDrives, or anything else that is invoked via a Powershell CLI
- Powershell searches for a predetermined file in a predetermined location
- Globally - $PSHome\profile.ps1
- User - $Profile\profile.ps1
- Powershell profiles will not execute if connected to a remote instance of the shell
- Powershell profiles will not execute when used within other products
- Powershell profiles will not execute when execution policy is set to Restricted or if the profile is not signed while the execution policy is set to AllSigned

Powershell Modules

- Powershell modules are installed in the systemwide module folder
  - C:\Windows\System32\WindowsPowerShell\v1.0\modules
- Custom modules can be built per user. They should be installed in the user's home directory
  - C:\Users\<userName>\Documents\WindowsPowerShell\Modules\<moduleFolderName>\<customModule>.psm1
- View module search paths with
  - Get-Content env:psmodulepath
- Modules must be added into the shell to use their functionality. They must remain loaded for the entire shell session while being used.
- View installed modules with
  - Get-Module -list

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Powershell Modules

- Active Directory Domain Services
- Active Directory Rights Management Services
- Applocker
- Best Practices Analyzer
- Background Intelligent Transfer Service
- Group Policy and Group Policy objects
- Network Load Balancing
- Windows Powershell Diagnostics
- Remote Desktop Services
- Server Manager
- Server Migration
- Troubleshooting Packs
- Web Administration
- Web Services for Management (WS-MAN)
- Windows Cluster Service
- Windows Server Backup

Server Manager

- Use Server Manager cmdlets to add roles, remove roles, and list roles
- User Server Manager cmdlets, along with Compare-Object, to provide a change configuration report for role changes on a server
- Three Server Manager cmdlets exist
  - Get-WindowsFeature
  - Add-WindowsFeature
  - Remove-WindowsFeature
- Gain access to these cmdlets by importing the SeverManager module
  - Import-Module ServerManager

Powershell and ActiveDirectory

- ActiveDirectory module is installed when RSAT is installed
- Includes cmdlets that faciliatate ActiveDirectory administration
- Its cmdlets provide the functionality that powers the graphical Active Directory Administrative Center Console
- Adding the ActiveDirectory module also adds a PSDrive
- It is bad practice to query every object in Active Directory at once
  - Is computationally expensive
  - Can impact Domain Controller's performance
- Most Active Directory cmdlets have a defined mandatory parameter called '-filter'
- Find Active Directory cmdlets with 'Get-Command *-AD*'

Powershell and ActiveDirectory Cont.

```
Import-Module ActiveDirectory
Get-Command *-AD*
```

```
Get-ADUser -Filter {Name -eq "ncwolf"}
```

Powershell Code Signing

Get-ExecutionPolicy
Get-Help about_signing
Execution Policies: Restricted / AllSigned / RemoteSigned / Unrestricted
Example Error Message:
The file C:\my_script.ps1 cannot be loaded. The execution of scripts is disabled on this system. Please see "Get-Help about_signing" for more details.
WolfTech Certificate Services
WolfTech Default Execution Policy is "AllSigned"

NCSU-Departmental OU Admins can request a code signing cert:
- You are responsible for the code if you sign it
- Use-Time cert password required on any script used outside your OU
- Certs must be published to “Trusted Publishers” store via GPO
- Scripts need to be saved as ANSI to be signed

```
PS C:\> Set-AuthenticodeSignature c:\foo.ps1 @(Get-ChildItem cert:\CurrentUser\My -codesigning)[0]
```

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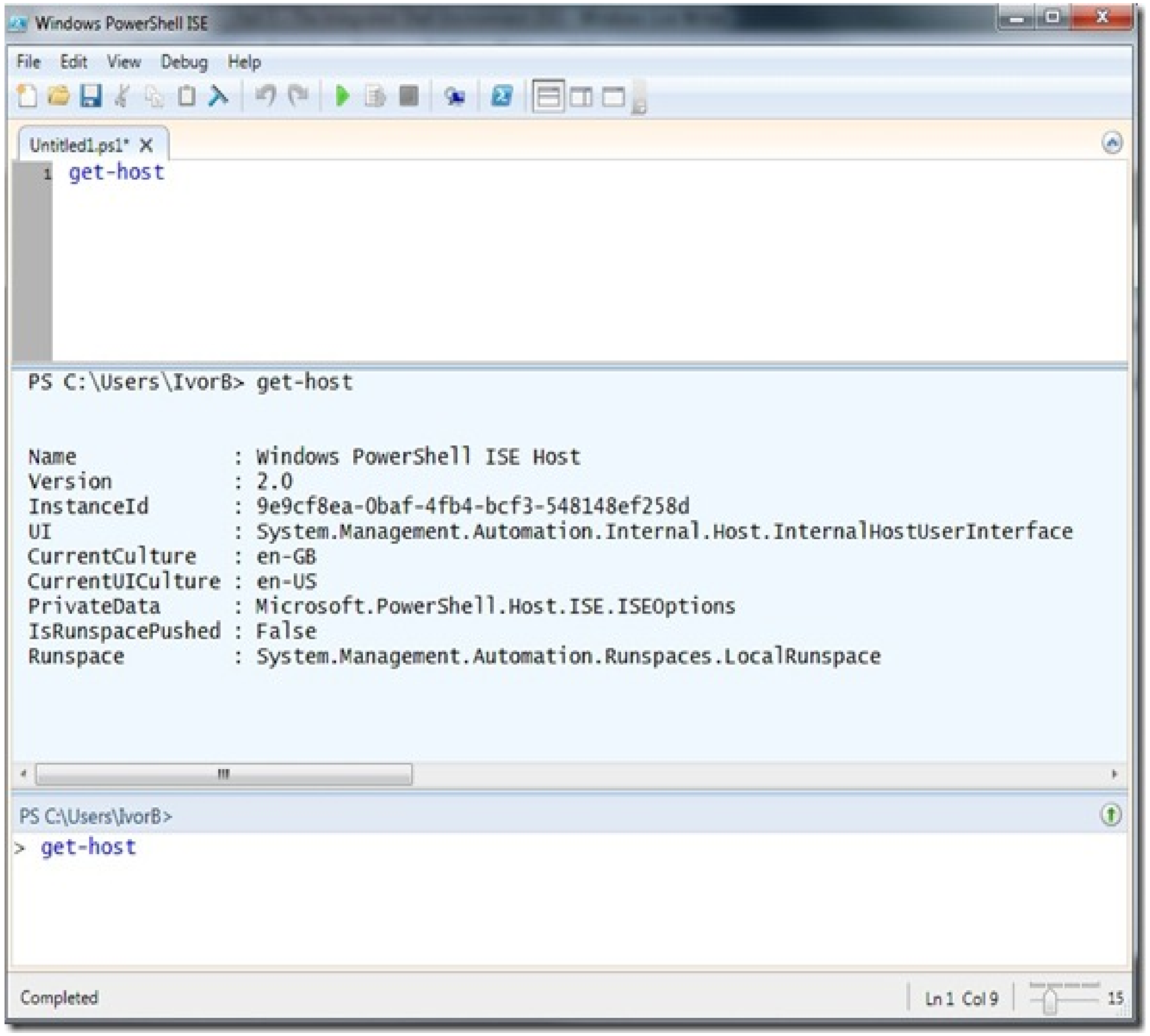
Powershell ISE



```
get-host
```

```
PS C:\Users\IvorB> get-host


Name             : Windows PowerShell ISE Host
Version          : 2.0
InstanceId       : 9e9cf8ea-0baf-4fb4-bcf3-548148ef258d
UI               : System.Management.Automation.Internal.Host.InternalHostUserInterface
CurrentCulture   : en-GB
CurrentUICulture : en-US
PrivateData      : Microsoft.PowerShell.Host.ISE.ISEOptions
IsRunspacePushed : False
Runspace         : System.Management.Automation.Runspaces.LocalRunspace
```

```
PS C:\Users\IvorB>
> get-host
```

- PowerShell ISE can run commands, write, test, and debug scripts in a single GUI
- Provides multiline editing, tab completion, syntax coloring, selective execution, context-sensitive help

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MSSQL/Failover Clustering Example

Using the SQL Server cmlets
Using the SQL Server PowerShell Provider

Note: Be Careful of Version (10.0) and Bit level (x86)

```
SQLPS: C:\Program Files\Microsoft SQL Server\100\Tools\Binn\sqlps.exe
Add-PSSnapin SqlServerProviderSnapin100
Add-PSSnapin SqlServerCmdletSnapin100
Get-PSSnapin
```

Failover Cluster Cmdlets in Windows PowerShell

Move all cluster resources off of "classdemosrv2":

```
Import-Module FailoverClusters
Get-ClusterGroup
Get-ClusterNode classdemosrv2 | Get-ClusterGroup | Move-ClusterGroup

Get-ClusterResource | Sort-Object -Property OwnerGroup
```

Powershell and VMware Example

PowerCLI Powershell API for VMware VCenter
Uses a Powershell SnapIn
Pipelining and Filtering

```
cd "C:\Program Files (x86)\VMware\Infrastructure\vSphere PowerCLI"
Add-PSSnapin -Name VMware.VimAutomation.Core
.\Scripts\Initialize-PowerCLIEnvironment.ps1
```

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MySQL .Net Example

Connector/Net: fully managed ADO.NET driver written in 100% pure C#

MySQL Powershell Module
MySql.Data.MySqlClient API Reference

```
[void][system.reflection.Assembly]::LoadFrom("$pwd\MySQL.Data.dll")
Import-Module $pwd\MySQL.psm1
$insert = Prepare-MySQL -server 'server' -database 'db' -user 'user' -password 'password'
$insert | Get-Member
```

If you have a .Net library and the API documentation, you can use it in Powershell

How do I know if something is using .Net?
Process Explorer
C:\Windows\assembly

AFS Example

The Powershell Script for mapping J and K drives has examples of:

- Looping
- Conditional Statements
- Functions
- Error Checking
- Accessing AD
- Balloon Tips

Additional Examples

Web Services - Jigsaw:
.\DellWebsiteFunctions.ps1
Get-DellWarranty IDKFA
Get-WMIObject -Class "Win32_BIOS" -Computer . | select SerialNumber

DFS/AD Groups - Celerra

UI:
Forms
WMI Explorer

SCCM Powershell Module

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Where Can I Go for Help?

AD Site

- http://activedirectory.ncsu.edu

Mailing Lists

- activedirectory@lists.ncsu.edu

Jabber

- "activedirectory" on conference.jabber.eos.ncsu.edu

Remedy

- wolftech_ad_technical@remedy.ncsu.edu

Governance Committees

- http://activedirectory.ncsu.edu/governance/

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Q & A