



The next generation command line scripting

Presented by  
Bob McCoy, CISSP/ISSAP, MCSE  
Microsoft Services  
Cyber Security Forum 07/18/2007

**Windows PowerShell**

- cmd.exe and command.com
  - Lack of scriptable functionality
  - Lack of documentation
- Windows Script Host (WSH)
  - Not integrated with the shell
  - Vulnerable
- Cscript
  - Not integrated with the shell
- Administrative tasks and automation too dependent on proprietary GUI based tools
- Scriptable wrappers difficult to implement

## Command Line Interface

- Gottfried Leibniz's monadology (1704)
  - Universe is a composite of fundamental elements (cmdlets) integrated in a pre-established harmony
- In place of CMD and WSH
- Microsoft GUI wrappers
- Supported on XP, Server 2003, Vista and Longhorn Server (x86, x64, IA64)
- Foundation for Exchange Server 2007
- Built on .NET Framework

## Background

- Object Orientation
- .NET Based (*requires .NET 2.0*)
- CLI & Scripting Language (C# like, Perl like)
- Cmdlets
- Platform Independent Utilities
- Users
  - Administrators
  - Scripters
  - System integrators

# Windows PowerShell

- Strong guidelines
- Aliasing
- Tab-completion & partial parameter usage
- Command line editing
- Pipelining
- Object utilities
- Better documentation
- Security

**Windows PowerShell**

- Cmdlets
  - Object oriented
  - Extensible
  - Easily discoverable
- Access to objects
  - ADO
  - .NET
  - WMI
  - COM
  - Etc...
- PSDrives

## Feature Highlights

- Loose
  - `$d="7/18/2007"`
  - `Function foo() {$args[0]}`
- "Strong"
  - `[datetime]$d="4/20/2005"`
  - `function foo([datetime]$date) {$date}`
  - `[int] [char] "a"`
- Extensible
  - `add-member $d Note Description "CSF Briefing"`
  - `$d.Description`
- PowerShell works on any .NET type - not a fixed set of "scripting types"

# Typing

- Basic Shell usage
  - Discovering PS commands and functionality
  - Get-Command
  - Get-Alias
  - Get-Help
  - Get-Member
- Other Useful cmdlets not in Demo
  - Select-Object
  - ForEach-Object
  - Where-Object
  - Sort-Object

**DEMO – Basic Usage**



- Access WMI data
- Use of alternate credentials
- `Get-WmiObject win32_share`
- `Get-WmiObject win32_share | Format-List [a-z]*`
- `GWmi win32_share | Format-Table Name,Path -hide`
- Binds to `root\cimV2` namespace on the local host by default, params

**Demo – WMI**

- A data store location
- Access it just like a file system drive
- New-Psdrive
- Get-Psdrive
- Set-Location (aliased to cd)
- Help About\_Provider

**Demo - PSDrive**

- Debug
  - Programmer-level information
- ErrorAction
  - SilentlyContinue* | *Stop* | *Continue* | *Inquire*
  - What to do if an error occurs?
- ErrorVariable *VariableName*
  - Assign errors to a variable
- Verbose
  - Additional information about the activities being performed

**Ubiquitous Parameters**

- Commands with side-effects support:
  - Whatif
    - `gps | where {$_.handles -ge 500} | stop-process -WhatIf`
  - Confirm
    - `Stop-process S* -Confirm`
  - Verbose
    - `Stop-Process [a-x]*[q]*[r-t] -Verbose`

**Interactivity**

- Get-ExecutionPolicy
- Set-ExecutionPolicy
  - Restricted | AllSigned | RemoteSigned | Unrestricted*
  - Policy can only be set by Admin
- Use of code signing
- Self-signing cert
  - <http://www.hanselman.com/blog/SigningPowerShellScripts.aspx>
  - Root ► Personal Cert ► Trusted Publisher
- Does not implicitly execute scripts from current directory

## Security – Execution Policy

```
"hello" | get-member
```

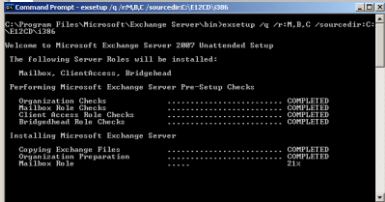
```
# SIG # Begin signature block
# MIIEMwYJKoZIhvcNAQcCoIIIEJDCBCACAQEExCzAJBgUrDgMCGGUAMGkGCisGAQQB
# gjcCAQSGWzBZMDQGCisGAQQBgjCAR4wJgIDAQAABBAfzDtgWUsITrck0sYpfvNR
# AgEAAgEAAgEAAgEAAgEAMCEwCQYFKw4DAhoFAAQUN0zmm7MbQLHr3Ay6MaRZ30DF
# ywCgggI9MIICOTCCAaagAwIBAgIQ/OlnVY3d169DGW1clWeFqjAJBgUrDgMCHQUA
# MCwxKjAoBgNVBAMTIVBvd2VyU2h1bGwgTG9jYWwgQ2VydG1maWNhdGUgUm9vdDAe
# Fw0wNzA3MjYxMzY1NDZaFw0zOTEyMzEyMzU5NTlaMB0xGDAWBgNVBAMTD1Bvd2Vy
# U2h1bGwgVXNlcjCBnzANBjkqhkIG9w0BAQEFAAOBjQAwgYkCgYEAoMd3ZkVZ0cAc
# 4kB2z5zIq7ttKsb+nK1Zv+WnuoIL89aW1XzZqqrXU5sAbBrLu1aq84I7lnTR/LxH
# 0Ts3EwaxXXdzwX45u4Dnhnp7IR6pdoVaOnOaKu6SU68sQD5CV5HKbBzbRyxBuDxX
# 57QgWHhsLwHN05+mG3G41XMgfLLI0WcCAwEAAAN2MHQwEwYDVR0lBAwwCgYIKwYB
# BQUHAwMwXQYDVR0BBFYwVIAQwH7/oqgShF/e6q4m27AtX6EuMCwxKjAoBgNVBAMT
# IVBvd2VyU2h1bGwgTG9jYWwgQ2VydG1maWNhdGUgUm9vdIIQCztDjdeS64tDd5vS
# 3g4NNTAJBgUrDgMCHQUAA4GBALdwm6EP3CoT4qjG5yNBvtNtO447duj7L1DjWBio
# np5C3CpV3uxmFlOh2eJhQRa8kfqfe7t+S0dchQv1rTLf7m65TwZeRf5yLLvOaKI5
# myZIDymYGBLE2H19iqWm8IdiVDaVCRi/H2XB/BtbkkfS7iekce3tF/4SL/vNSRMW
# 1Tj6MYIBYDCCAwwCAQEwQDAsMSowKAYDVQQDEyFQb3dlclNoZWxsIExvY2FsIENl
# cnRpZmljYXRlIFJvbnQCEPzpZ1WN3devQxltXJVnhaowCQYFKw4DAhoFAKB4MBGg
# CisGAQQBgjCAR4wJgIDAQAABBAfzDtgWUsITrck0sYpfvNRAGUwGkGCisGAQQB
# AQQwHAYKKwYBBAGCNwIBCzEOMAwGCisGAQQBgjCARUwIwYJKoZIhvcNAQkEMRYE
# FITgShAtGf7rHeEmHnBR40TpbGerMA0GCSqGSIb3DQEBAQUABIGAOiR6OP3ixsjE
# Lks/xqcSHeYwjXfgIODFUGUnzBJr8nm/tsFvbfGEkgWYu0M8MqCvt7W90vIQT1Mq
# iF8eEr+8e17mj0puGvForlwRR3aP9kAcPhVC946t87ymtx/+RLbmxkbKM5/iJOagW
# EDkfvHuVHbXzChe6ZS8j3HbjNV0HKLA=
# SIG # End signature block
```

# Code Signing Sample

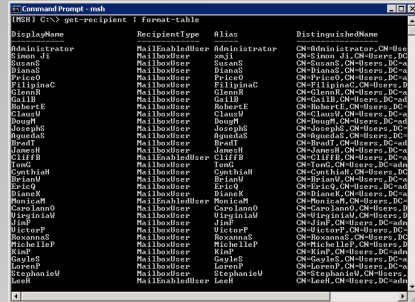
- Read-Host -assecurestring
- ConvertTo-SecureString
- ConvertFrom-SecureString
- Encryption
  - No Key – uses Triple-DES
  - With Key – uses Rijndael
  - Windows Data Protection (DPAPI)  
<http://msdn2.microsoft.com/en-us/library/ms995355.aspx>
  - <http://www.leeholmes.com/blog/SecureStringsInPowerShell.aspx>
  - get-help ConvertFrom-SecureString

## Security – Passwords

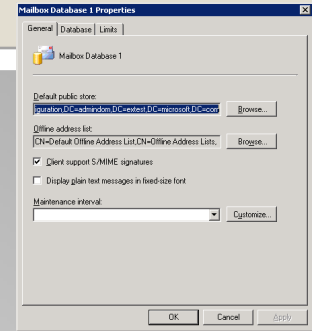
# Setup



# CLI



# GUI



WinForms  
ADO.Net  
PS Provider

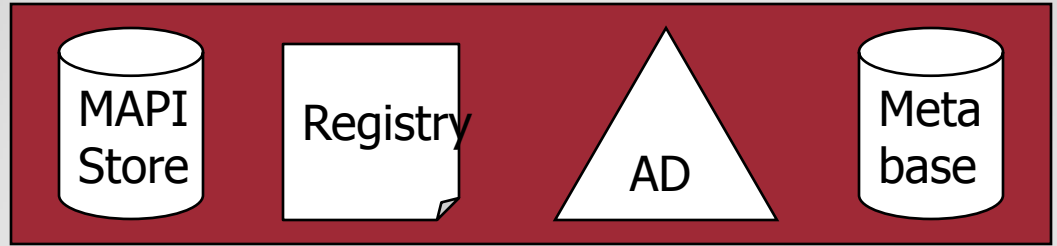
WinForms  
Early-bound objs

# PS Engine

# Exchange cmdlets

# Configuration Data Access

Process boundary



# E2007 Management Architecture



- PowerShell is extremely powerful (and very cool)
- The price is right for Windows users
- Documentation is extensive
- Scripting experience much richer at both design and execution time
- Strong community support (blogs, repositories, books)

**Wrap Up**

- Official PowerShell site  
<http://www.microsoft.com/powershell>
- TechNet Scripting Center  
<http://www.microsoft.com/technet/scriptcenter/hubs/msh.msp>
- PowerShell Team Blog  
<http://blogs.msdn.com/PowerShell/>
- Sapien Press Blog  
<http://blog.sapien.com/>
- The PowerShell Guy  
<http://thepowershellguy.com/>
- Books
  - “PowerShell Step-by-Step” (MSPress)
  - “PowerShell TFM” (Sapien Press)
  - “Windows PowerShell in Action” (Manning Pub)
  - “Windows PowerShell Quick Reference” (O’Reilly)

## Resources

## Demo Script

Get-process

```
Ps | where { $_.handles -gt 500 }
```

```
Ps | where { $_.handles -gt 1000 } | sort ws -descending | select-object -first 5
```

```
Ps | gm
```

```
$g = ps notepad; $g.WaitForExit()
```

```
$g = ps notepad; $g.Kill()
```

---

Get-service

```
Get-service | where { $_.status -eq "running" }
```

```
Get-service | format-table -groupby status
```

```
Get-service | sort status | format-table -groupby status
```

```
Get-service | sort status,name | format-table -groupby status
```

---

## WMI

Get-WMIObject Win32\_Share

```
Get-WMIObject -list | where { $_.name -like "win32*" }
```

```
gwmi win32_share | format-table name,status,description -auto -hide
```

---

## Regex

```
("foo" -match "o")
```

```
("foo" -match "^o")
```

```
("foo" -match "o$")
```

```
("foo" -match "[a-l]")
```

```
("foo" -match "[a-l].*o$")
```

```
("foo" -match "[a-l].*x$")
```

```
[regex]$rx = "[a-l].*o$"
```

```
"foo" -match $rx      "fox" -match $rx
```

## Date and Time

```
$d = get-date
```

```
$d.dayofweek
```

```
$d.adddays(90)
```

```
$d.getdatetimestrings()
```

```
$d.touniversaltime().tolocaltime()
```

```
$bd = get-date -year 2007 -month 6 -day 25
```

```
$d - $bd
```

```
($d - $bd).days
```

---

## Registry

```
$r = get-item 'HKLM:\software\Microsoft\Windows\CurrentVersion\Run'
```

```
$r.getvaluenames()
```

```
$r.getvalue("Zune Launcher")
```

```
$reg = get-item "HKCU:\Software\Microsoft\Windows\CurrentVersion"
```

```
$r = $reg.OpenSubKey("run",$true)
```

```
$r.setvalue("foo","bar")
```