SQL Saturday Atlanta

POWERSHELL FOR THE SQL SERVER DBA

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Data Platform

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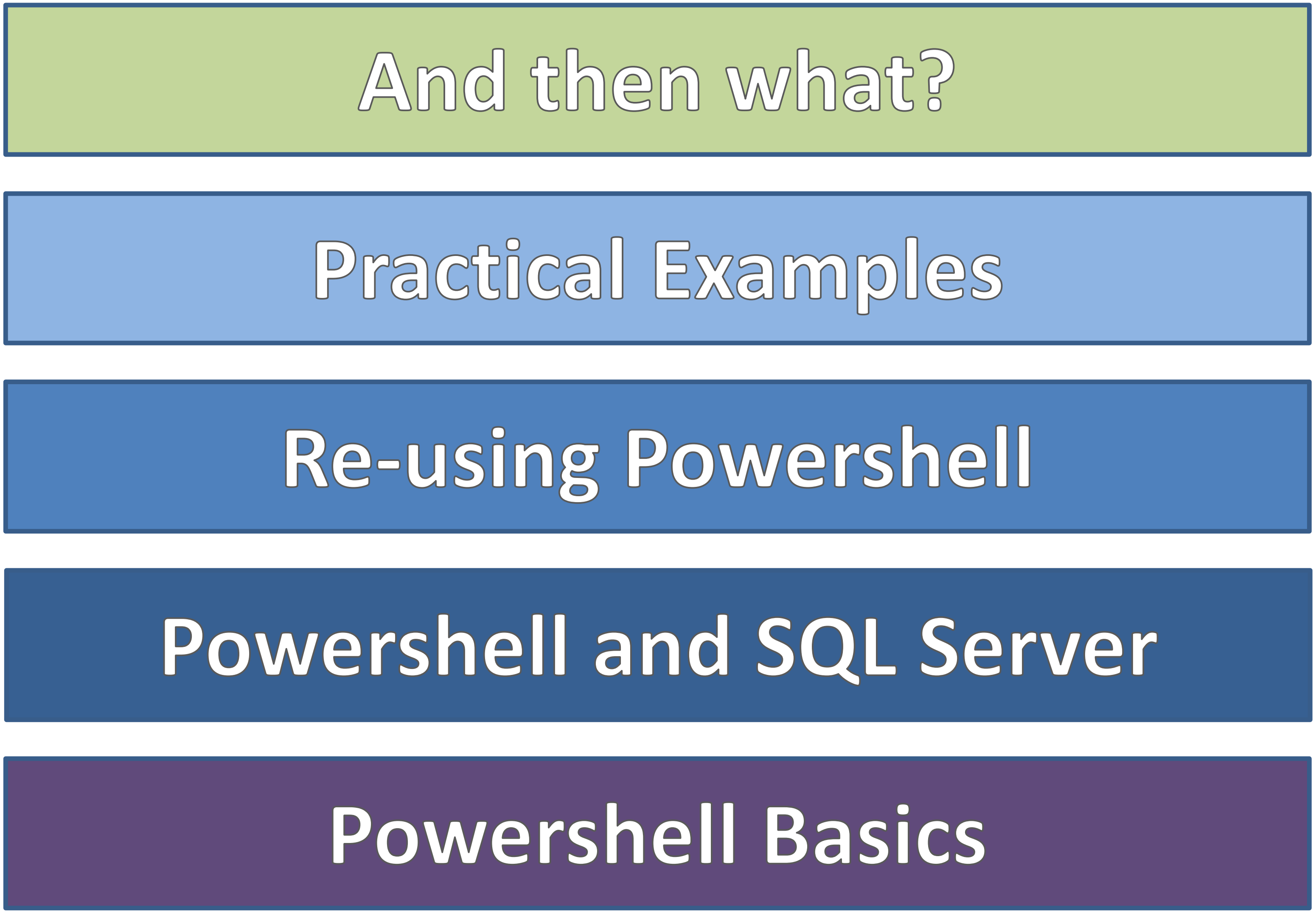
The fine print

Get-Agenda



And then what?

Practical Examples

Re-using Powershell

Powershell and SQL Server

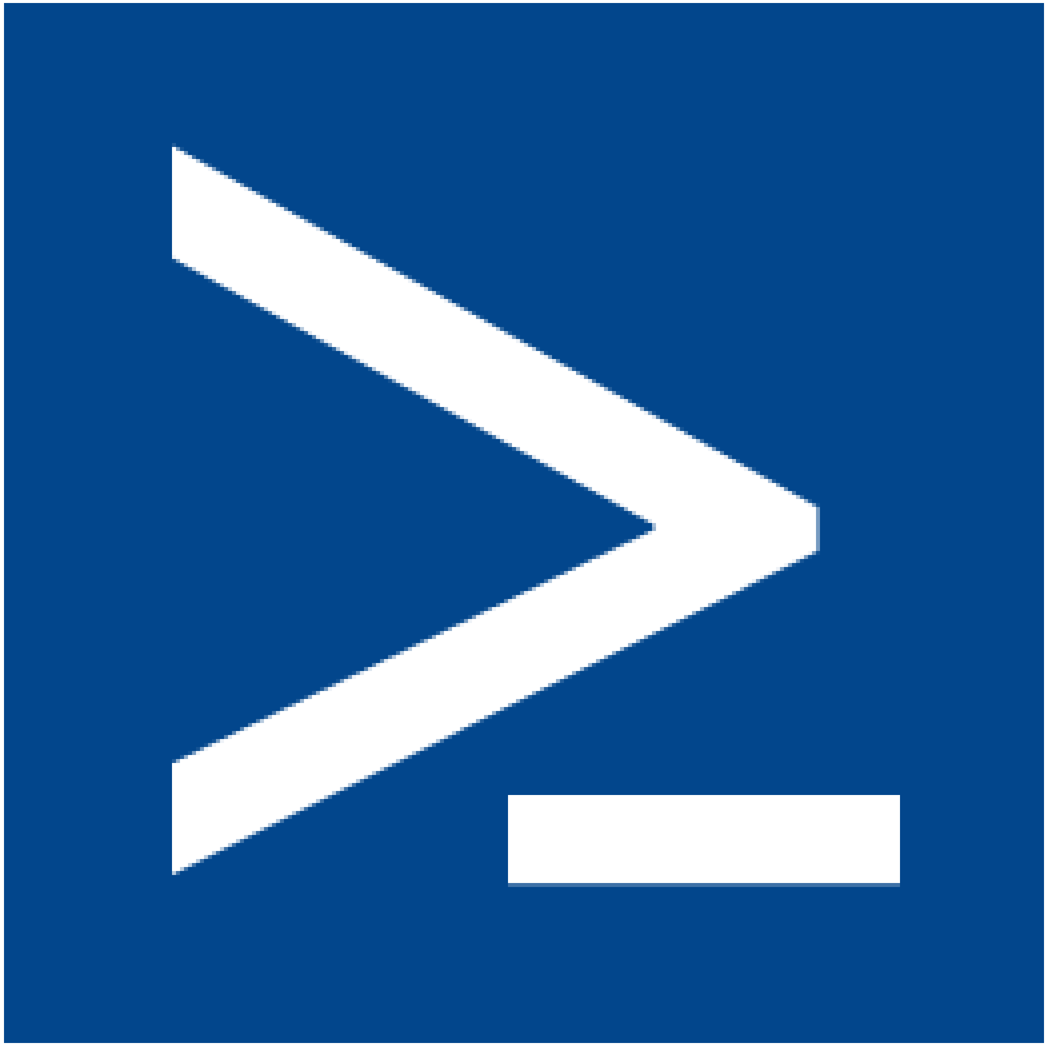
Powershell Basics

Ground Rules

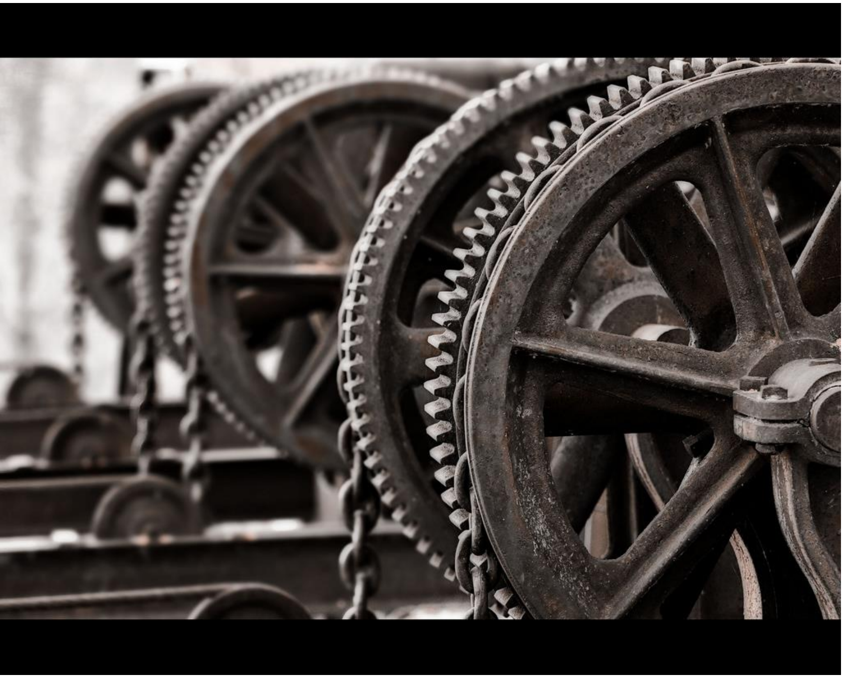
Don’t focus on the code, focus on the concepts.

Ask questions!

What is Powershell?



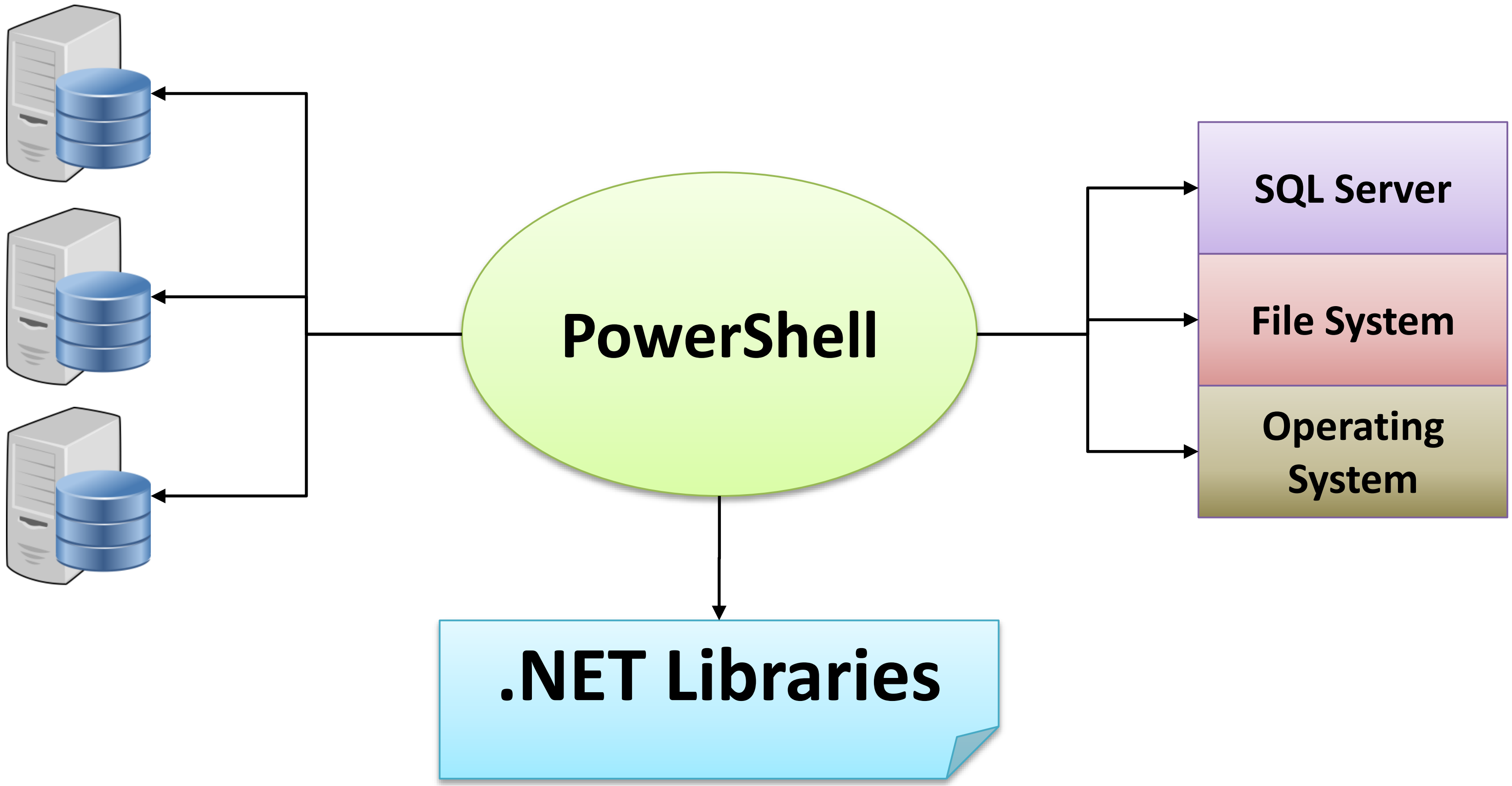
But for what?



The Facts

- Envisioned by Jeffery Snover – 2002
  - The Monad Manifesto
- Released as Powershell RC 1 – April 2006
  - Originally called Project “Monad”
- Current available version: 5.0
  - Just released, 4.0 has been out for a bit

Why PowerShell?



PowerShell

SQL Server

File System

Operating System

.NET Libraries

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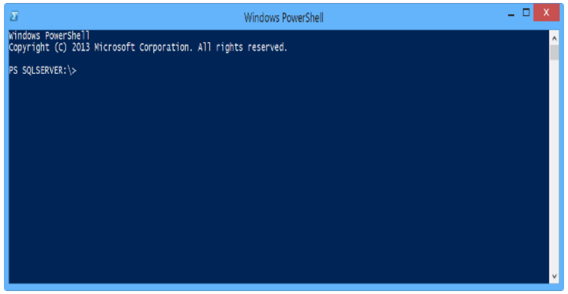
Pieces and Parts

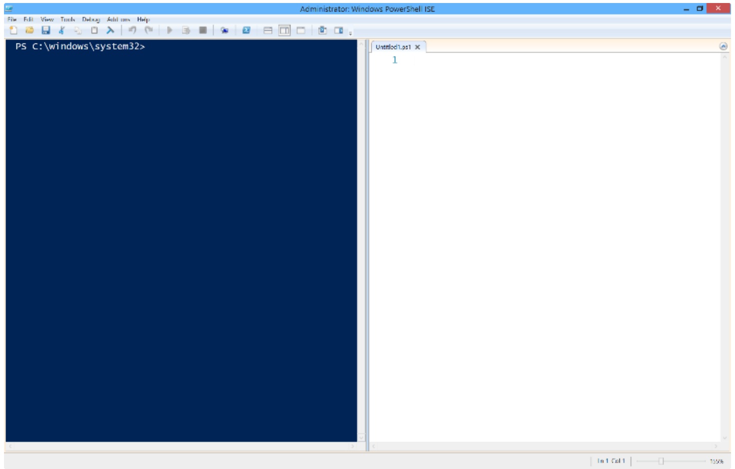
Hosts



```
Windows PowerShell
Copyright (C) 2013 Microsoft Corporation. All rights reserved.

PS SQLSERVER:\>
```

Powershell.exe



```
PS C:\windows\system32>
```

Powershell ISE

System.Management.Automation

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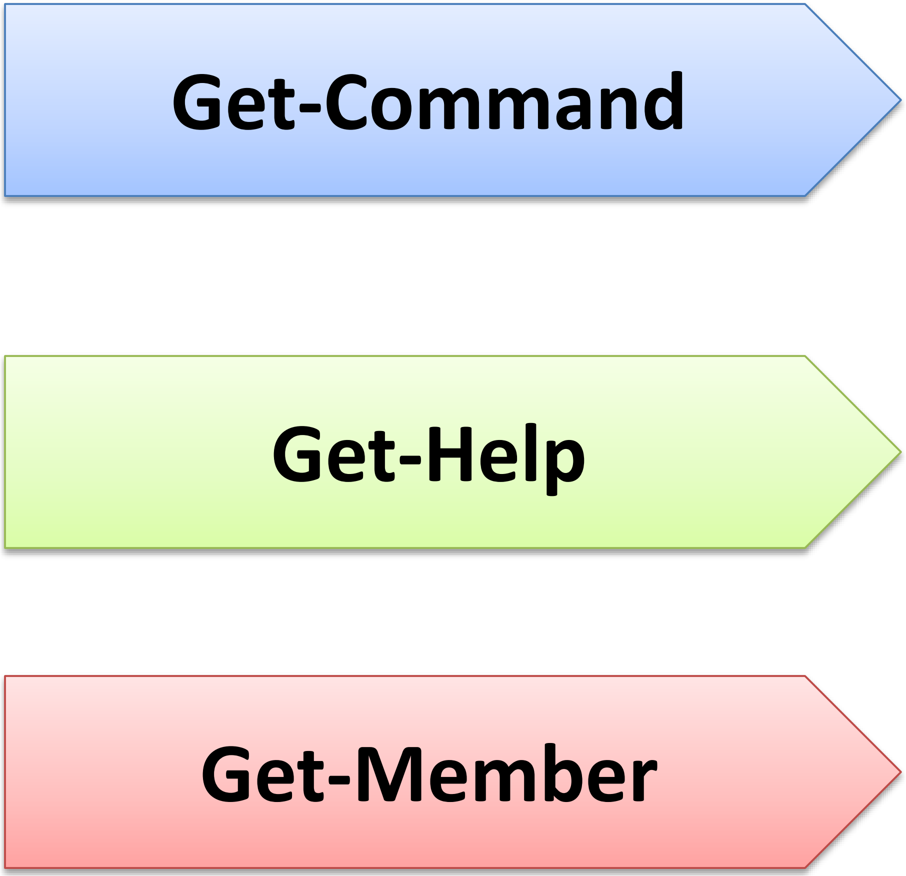
Learn Within Powershell



Get-Command

List Commands:
	New
	-Module SQLPS

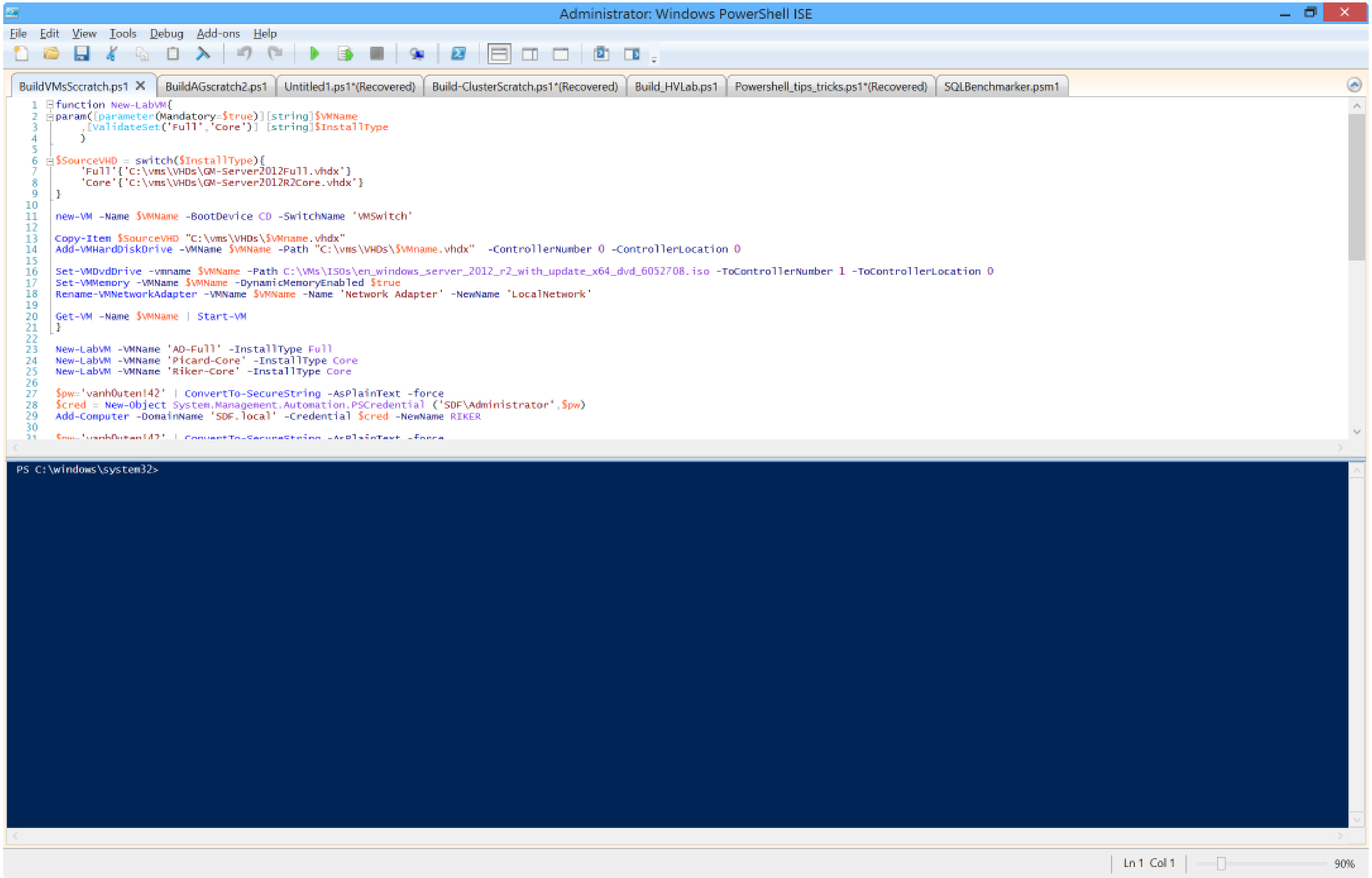
Get-Help

Show help info:
	man, help
	-ShowWindow

Get-Member

Methods and properties

Demo – The ISE


Administrator: Windows PowerShell ISE
File
Edit
View
Tools
Debug
Add-ons
Help
BuildVMsSccratch.ps1
BuildAGscratch2.ps1
Untitled1.ps1*(Recovered)
Build-ClusterScratch.ps1*(Recovered)
Build_HVLab.ps1
Powershell_tips_tricks.ps1*(Recovered)
SQLBenchmarker.psm1
Ln 1 Col 1
90%

```
function New-LabVM{
param([parameter(Mandatory=$true)][string]$VMName
      ,[ValidateSet('Full','Core')] [string]$InstallType
      )

$SourceVHD = switch($InstallType){
      'Full'{'C:\vms\VHDs\GM-Server2012Full.vhdx'}
      'Core'{'C:\vms\VHDs\GM-Server2012R2Core.vhdx'}
}

new-VM -Name $VMName -BootDevice CD -SwitchName 'VMSwitch'

Copy-Item $SourceVHD "C:\vms\VHDs\$VMname.vhdx"
Add-VMHardDiskDrive -VMName $VMName -Path "C:\vms\VHDs\$VMname.vhdx"  -ControllerNumber 0 -ControllerLocation 0

Set-VMDvdDrive -vmname $VMName -Path C:\VMs\ISOs\en_windows_server_2012_r2_with_update_x64_dvd_6052708.iso -ToControllerNumber 1 -ToControllerLocation 0
Set-VMMemory -VMName $VMName -DynamicMemoryEnabled $true
Rename-VMNetworkAdapter -VMName $VMName -Name 'Network Adapter' -NewName 'LocalNetwork'

Get-VM -Name $VMName | Start-VM
}

New-LabVM -VMName 'AD-Full' -InstallType Full
New-LabVM -VMName 'Picard-Core' -InstallType Core
New-LabVM -VMName 'Riker-Core' -InstallType Core

$pw='vanhOuten!42' | ConvertTo-SecureString -AsPlainText -force
$cred = New-Object System.Management.Automation.PSCredential ('SDF\Administrator',$pw)
Add-Computer -DomainName 'SDF.local' -Credential $cred -NewName RIKER

$pw='vanhOuten!42' | ConvertTo-SecureString -AsPlainText -force
```

```
PS C:\windows\system32>
```

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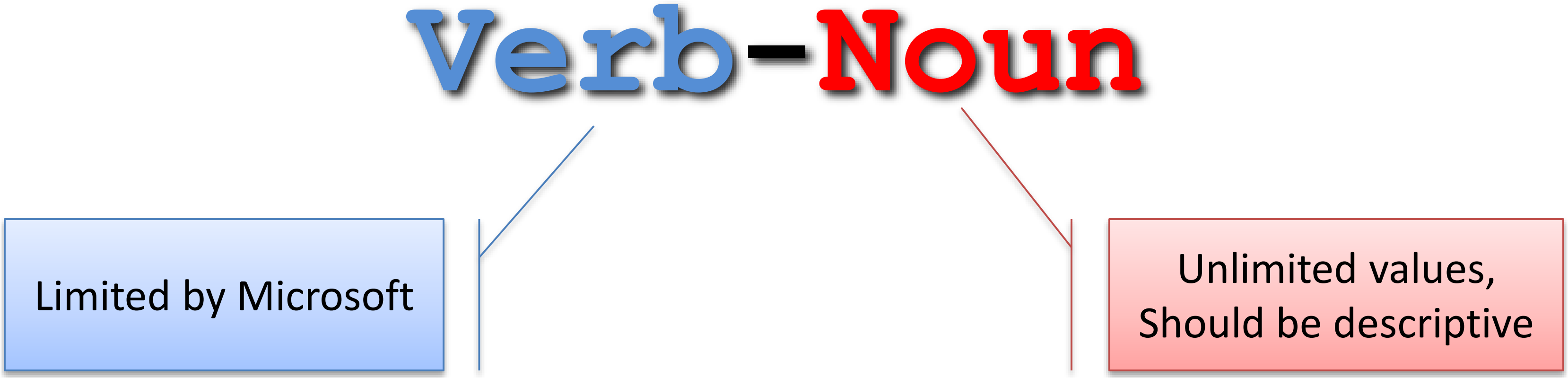
Writing Powershell

noster qui es in caelis san
tur nomen tuum adveniat
num tuum fiat voluntas tu
ut in caelo et in terra pan
strum cotidianum da n
hod

cmdlets

Fundamental unit of “getting stuff done”

- `Get-Help`
- `New-Item`
- `Remove-Module`



Verb-Noun

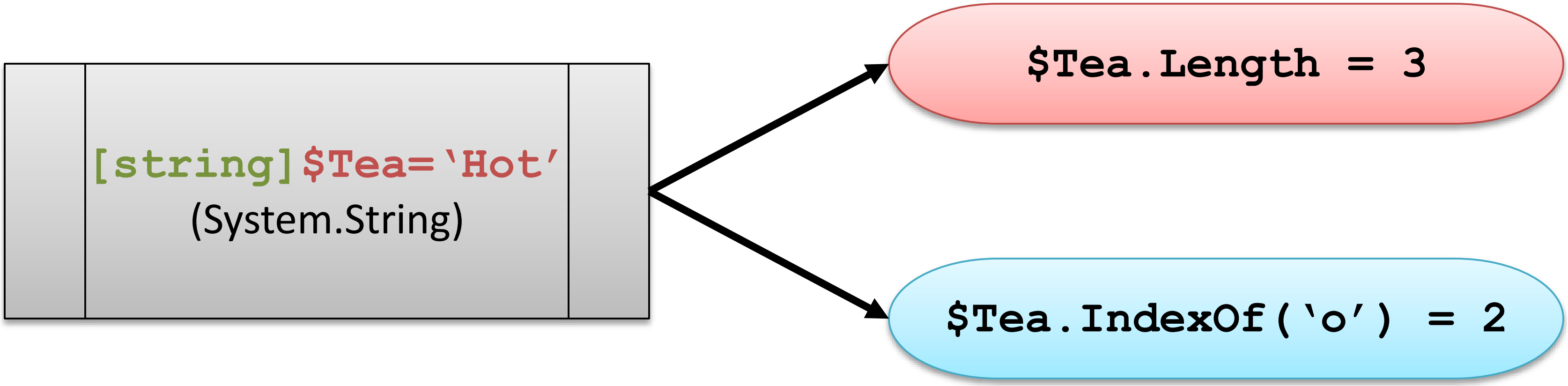
Limited by Microsoft

Unlimited values,
Should be descriptive

Object Oriented Thinking

Everything is a .Net object!

- Properties (attributes)
- Methods (functions, do things)



[string]$Tea='Hot'
(System.String)

$Tea.Length = 3

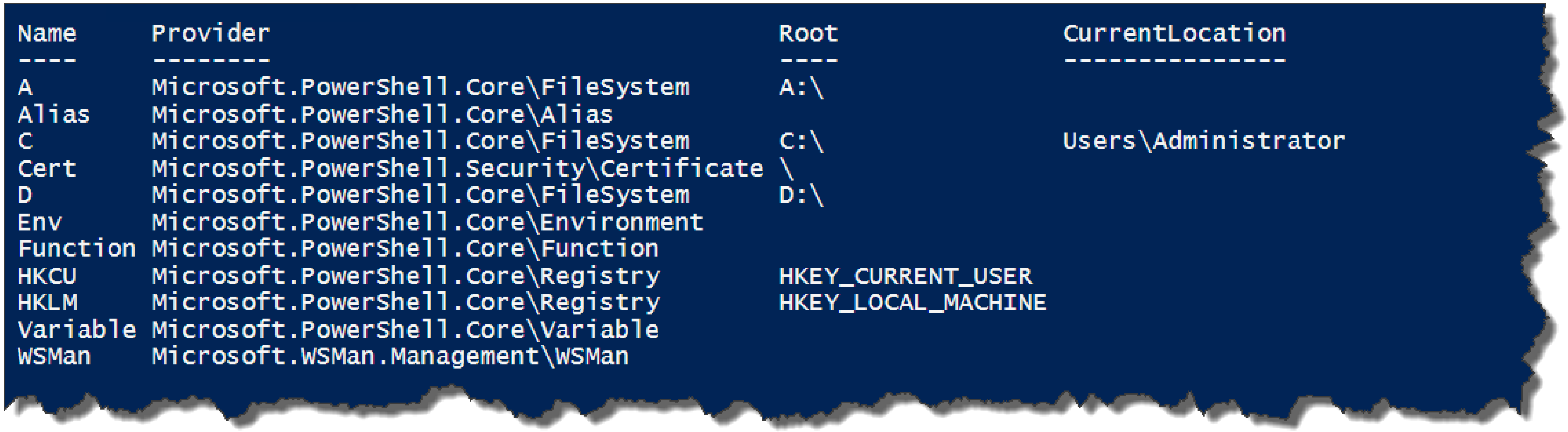
$Tea.IndexOf('o') = 2

Variables

‘$’ indicates a variable

```
[string]$Tea = ‘Hot’
$Tea = ‘Hot’
$TeaTime = Get-Date
```

Providers



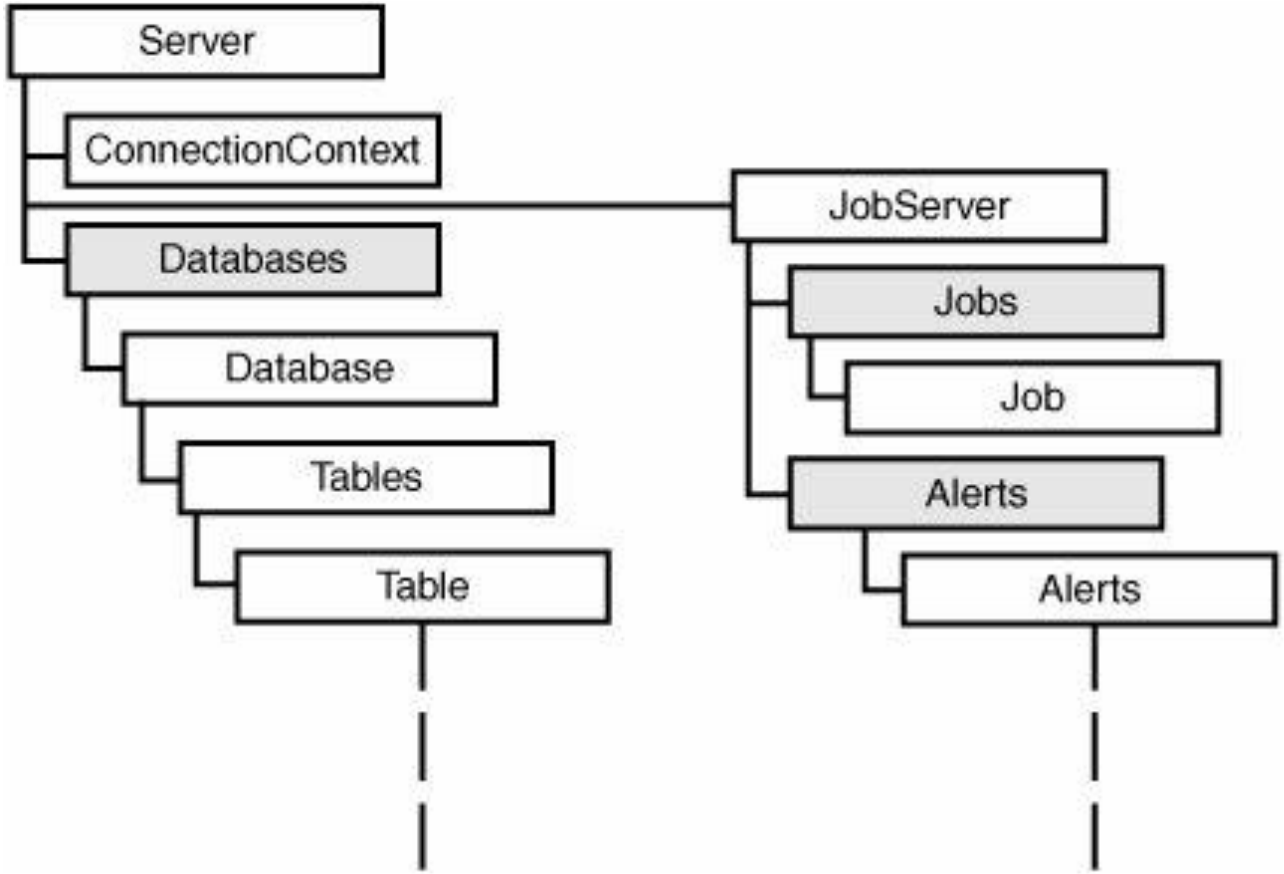
```
Name     Provider                                  Root               CurrentLocation
----     --------                                  ----               ---------------
A        Microsoft.PowerShell.Core\FileSystem      A:\
Alias    Microsoft.PowerShell.Core\Alias
C        Microsoft.PowerShell.Core\FileSystem      C:\                Users\Administrator
Cert     Microsoft.PowerShell.Security\Certificate \
D        Microsoft.PowerShell.Core\FileSystem      D:\
Env      Microsoft.PowerShell.Core\Environment
Function Microsoft.PowerShell.Core\Function
HKCU     Microsoft.PowerShell.Core\Registry        HKEY_CURRENT_USER
HKLM     Microsoft.PowerShell.Core\Registry        HKEY_LOCAL_MACHINE
Variable Microsoft.PowerShell.Core\Variable
WSMan    Microsoft.WSMan.Management\WSMan
```

Windows Components as Drives

Get-PSDrive

Explore/Use like a FileSystem

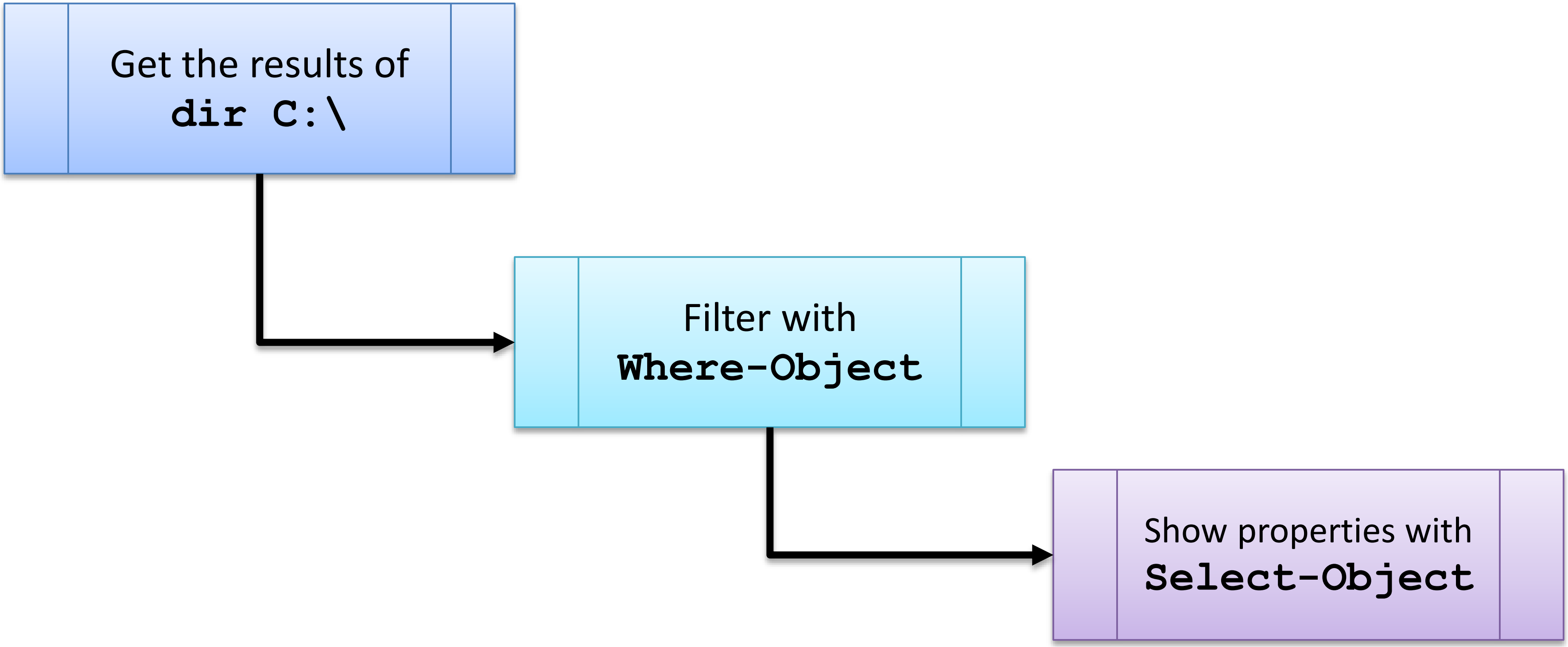
Demo – CMDLETS, Objects, Providers



Pipeline

How does it work?

```
dir C:\ | Where-Object {$_.PsIsContainer -eq $true} |
Select-Object name
```



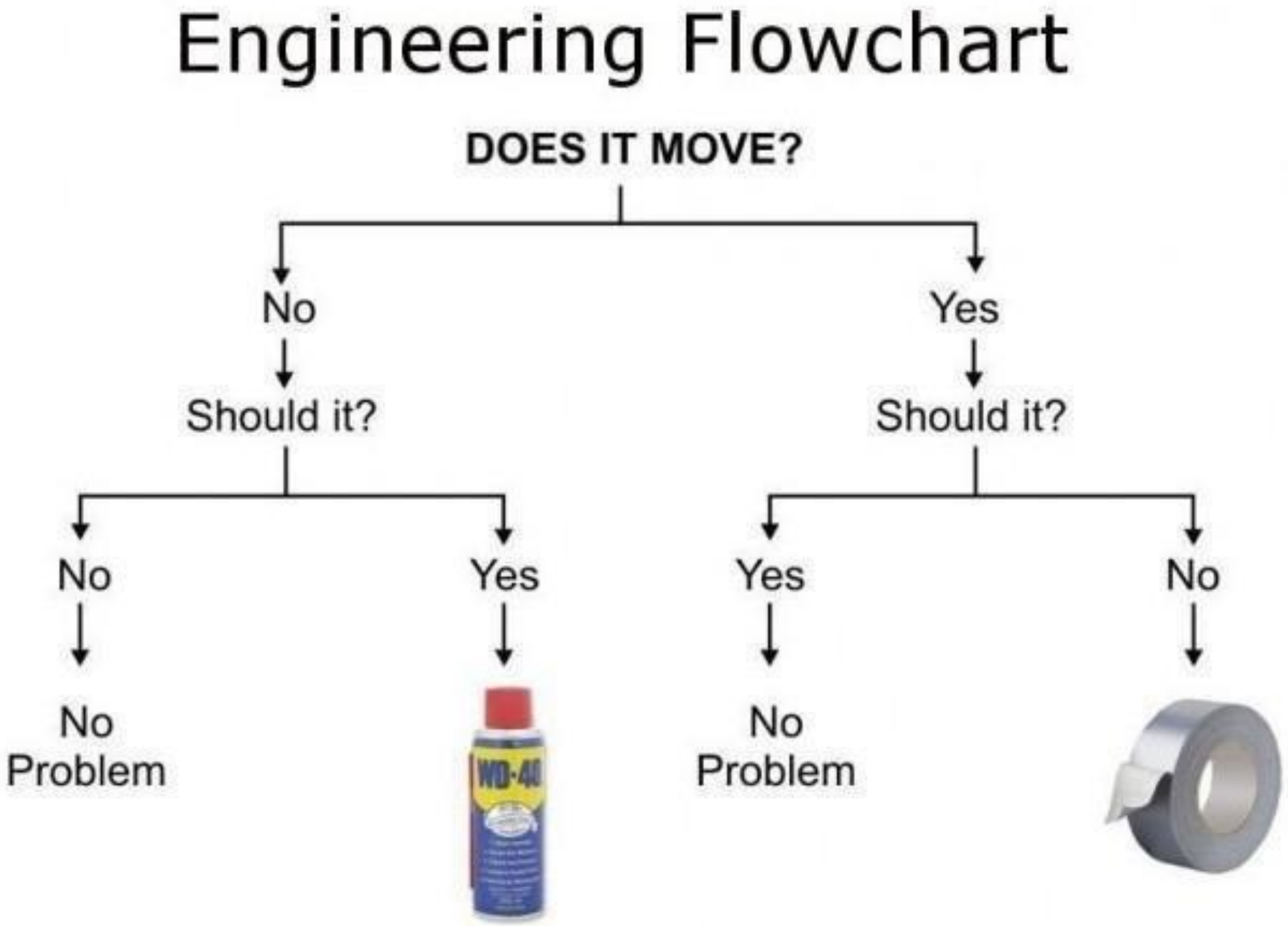
Get the results of **`dir C:\`**

Filter with **`Where-Object`**

Show properties with **`Select-Object`**

Demo - Pipeline

Control Logic



Operators

Shell Syntax

> - Redirect output, not greater than

< - Take input, not less than

= - Set value, not equality

Powershell Operators

-eq and -ne – equality check

-lt, -le, -gt, -ge – Less than and Greater than

-and, -or – Combine conditions

-like, -notlike – Wild card comparisons

Control Flow - Conditionals

```
If(<condition>){
     <script block>
}
Else {
     <script block>
}

Switch(<item>){
     <value> { <script block> }
     <value> { <script block> }
     …
}
```

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Control Flow - Loops

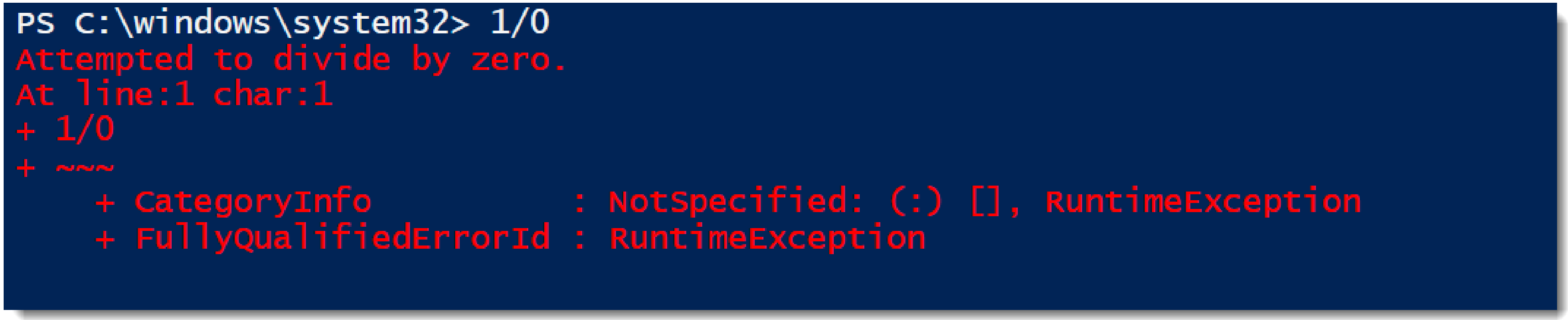
```
For(<start>;<check>;<iteration>){
    <script block>
}

Do{
    <script block>
} While/Until (<condition>)

ForEach(<object> in <collection>){
    <script block>
}
```

`Break` – Exit Loop

Error Handling

`$Error` – System error collection

`$Error[0]` – Always the last error



```
PS C:\windows\system32> 1/0
Attempted to divide by zero.
At line:1 char:1
+ 1/0
+ ~~~
    + CategoryInfo          : NotSpecified: (:) [], RuntimeException
    + FullyQualifiedErrorId : RuntimeException
```

Error Handling

```
Try{
        <script block>
}
Catch{
        <script block>
}
Finally{
        <script block>
}
```

`Throw` – Create an exception

Demo – Control Flow/Error Handling

Break!

Review

What are the three key cmdlets for discovery in Powershell?

Get-Command, Get-Help, Get-Member

If you want to use a cmdlet to create something (file, directory, object), what verb will it use?

New

How can you extend the functionality of a command in one line?

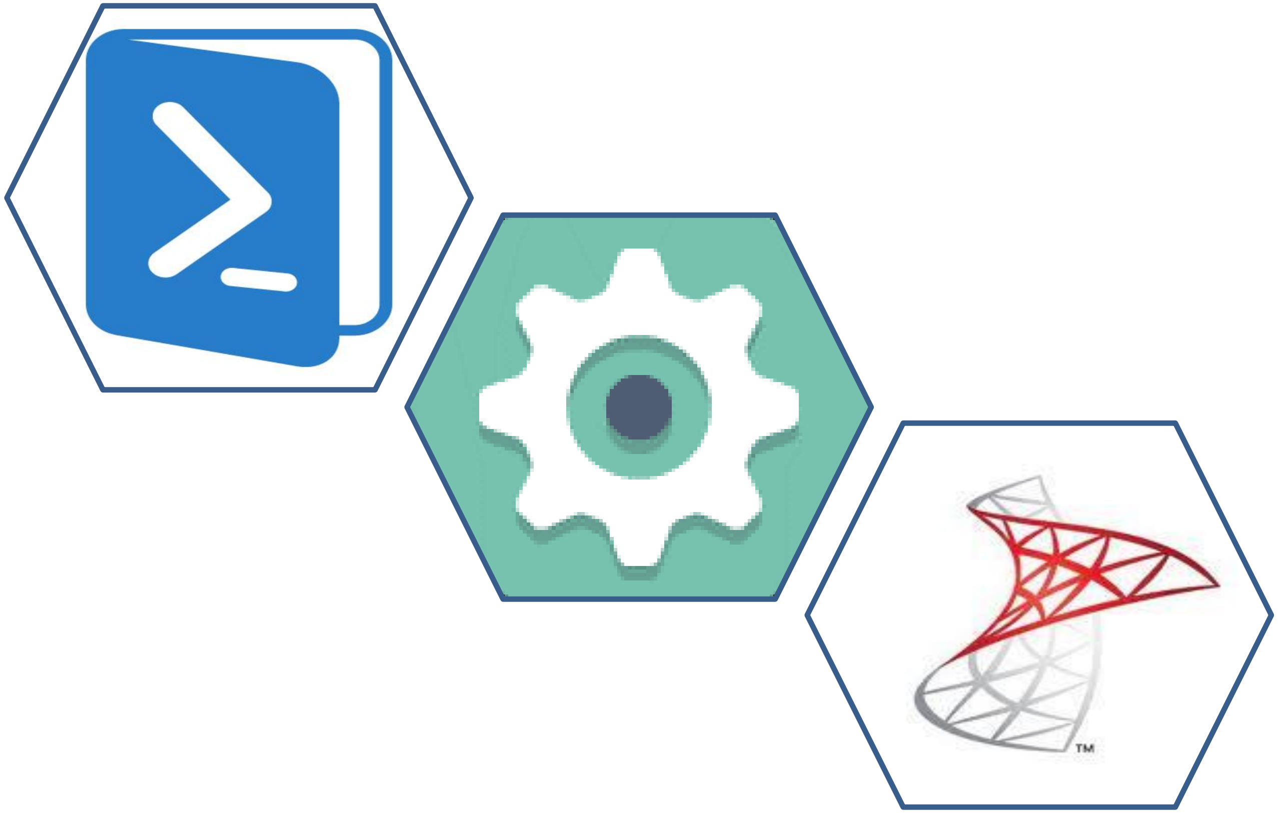
Use the pipeline

What would you use to loop through a collection of objects?

ForEach(){ }

Practical Use

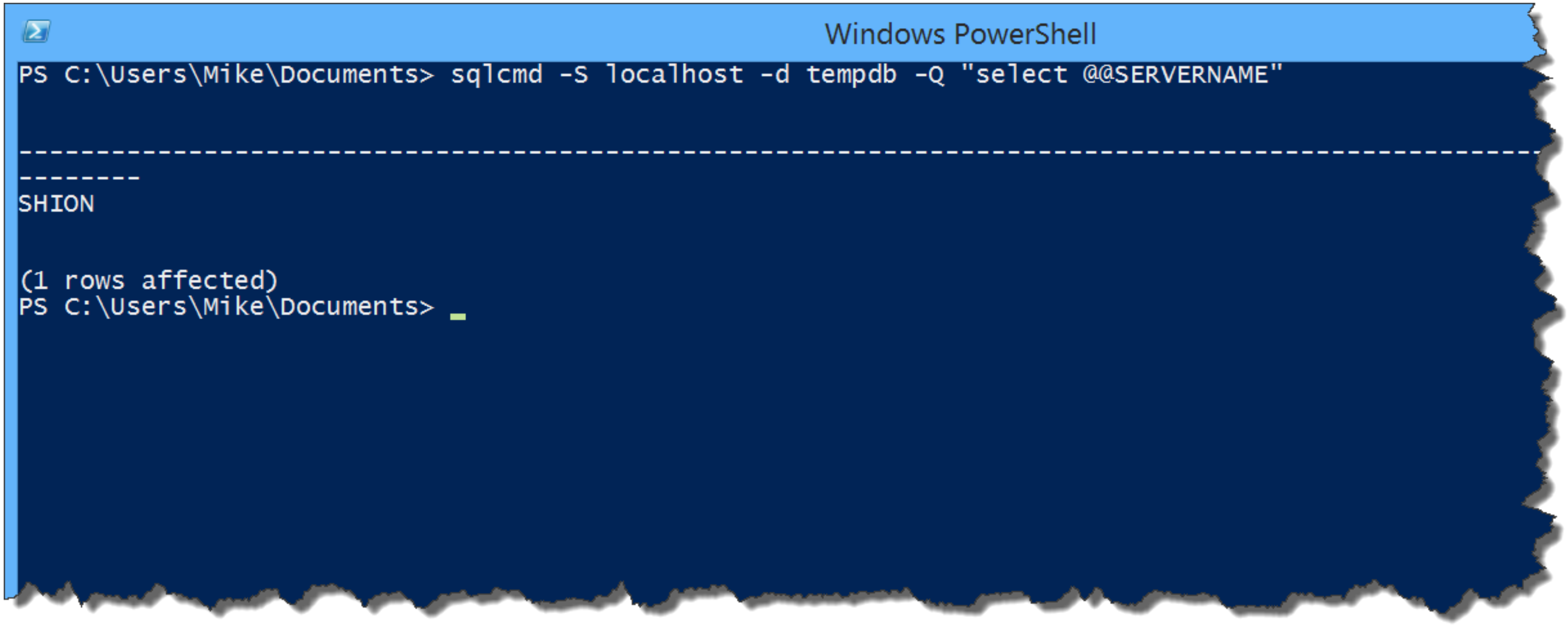
Powershell And SQL Server



Ways to work with SQL Server

- Command line (sqlcmd)
- SQL Server provider (sqlps)
- Server Management Objects (SMO)
- Powershell in the SQL Agent

sqlcmd



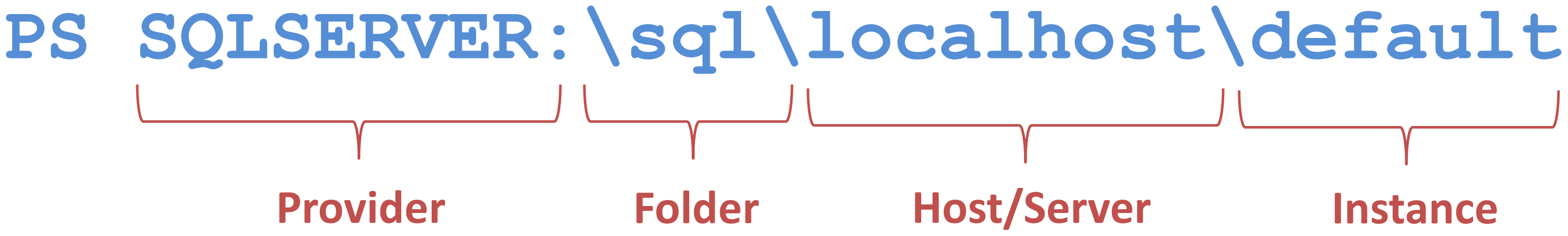
```
PS C:\Users\Mike\Documents> sqlcmd -S localhost -d tempdb -Q "select @@SERVERNAME"


-----------------------------------------------------------------------------------------------------
--------
SHION


(1 rows affected)
PS C:\Users\Mike\Documents> _
```

SQL Server Provider

```
Import-Module SQLPS
```

Included with SQL 2012+ client

(Always use the most current client tools)



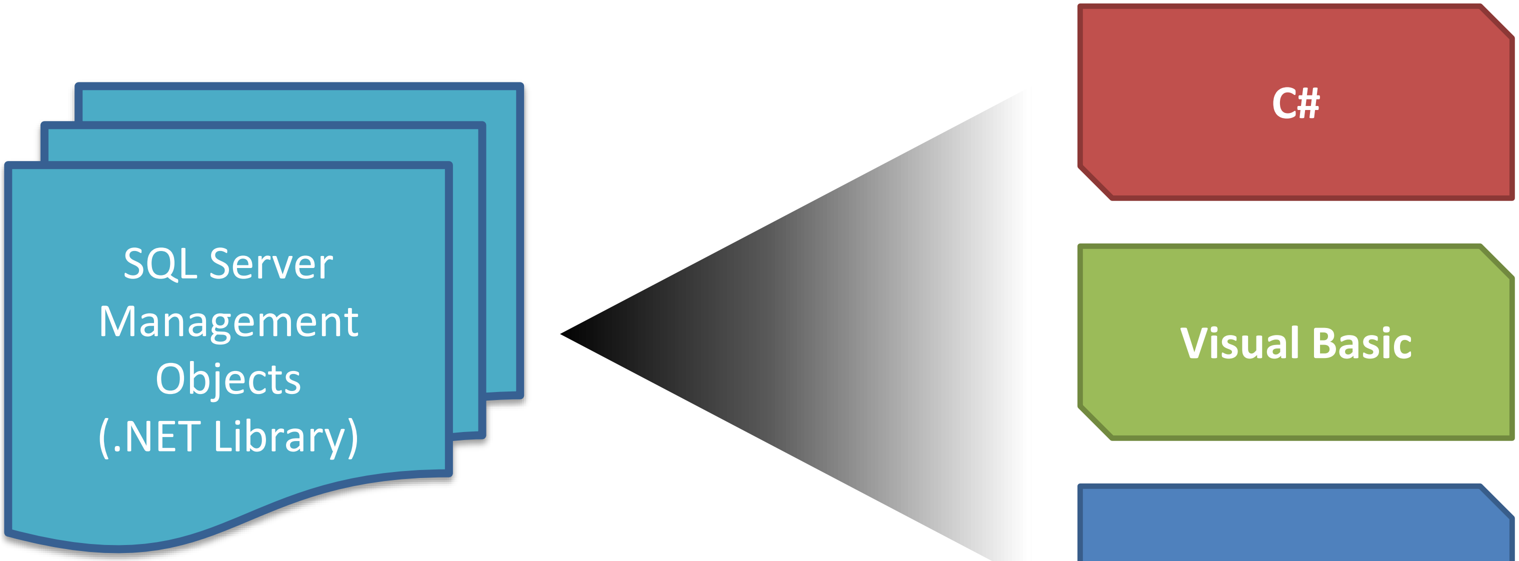
```
PS SQLSERVER:\sql\localhost\default
```

Invoke-SqlCmd

- Works almost like sqlcmd
- Some differences
  - Returns objects
  - Not interactive
  - Not all sqlcmd switches supported
- More object oriented

Demo - SQLPS and sqlcmd

SMO



SQL Server Management Objects (.NET Library)

C#

Visual Basic

PowerShell

Requires .NET framework 2.0

What does it give us?

- Robust, object aware feature set
  - Flexibility
  - Durability
- Increased complexity, but also increased re-usability

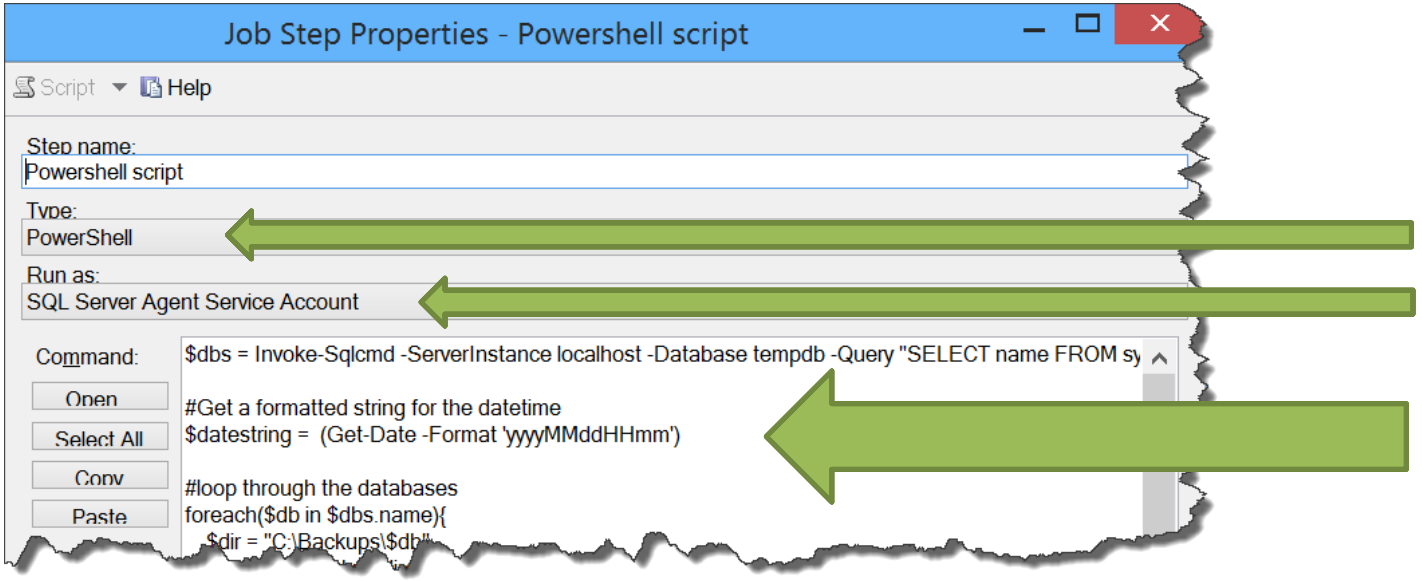
Demos – Using the SMO

Powershell in SQL Agent Jobs

Use SQL Agent to mange jobs

Easily integrate Powershell with your tasks

What does it look like?



Step name: Powershell script

Type: PowerShell

Run as: SQL Server Agent Service Account

Command:

```
$dbs = Invoke-Sqlcmd -ServerInstance localhost -Database tempdb -Query "SELECT name FROM sy

#Get a formatted string for the datetime
$datestring =  (Get-Date -Format 'yyyyMMddHHmm')

#loop through the databases
foreach($db in $dbs.name){
    $dir = "C:\Backups\$db"
```

Step Type

Run As

Script

Uses SQL Server's "mini" shell

Powershell 2.0 (boooo)

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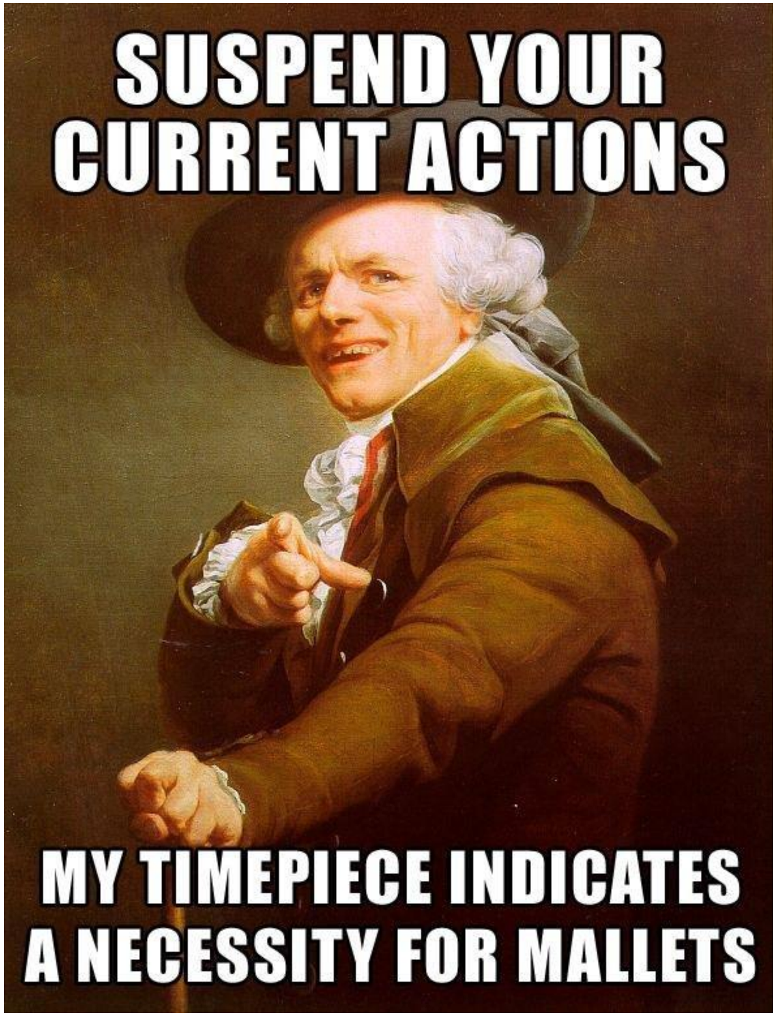
Demo – Powershell and SQL Agent

Break!


SUSPEND YOUR CURRENT ACTIONS
MY TIMEPIECE INDICATES A NECESSITY FOR MALLETS

Review

Once you’ve loaded the SQLPS, how would you start working with the provider interactively in Powershell?

cd SQLSERVER:

By default, what security account will a SQL Server Agent job run a Powershell script?

SQL Server Agent service account

Can you use Invoke-SqlCmd interactively?

No

To create a new SMO server object, what cmdlet will you use?

New-Object

Practical Use

Script re-use

Code Re-use: Scripts

Save your work as scripts (.ps1)

Powershell Scripts can be parameterized

```
param($VariableName)
```

Parameters are referenced

- Positionally
- Variable name becomes parameter name

Code Re-use: Functions

You can package code into functions

```
function Function-Name{ }
```

Functions can be parameterized like scripts

They can also be called within a script

```
Get-Help about_Functions
```

Code Re-use: Module

You can make your own modules to use

No special syntax, just save as a .psm1

Allows us to use custom functions direct from the command line.

Install to either:

- C:\Users\<user>\Documents\WindowsPowerShell
- C:\Program Files\WindowsPowerShell

```
Get-Help about_Modules
```

Code Re-Use: Your Profile

Sort of like a module, loads whenever you start

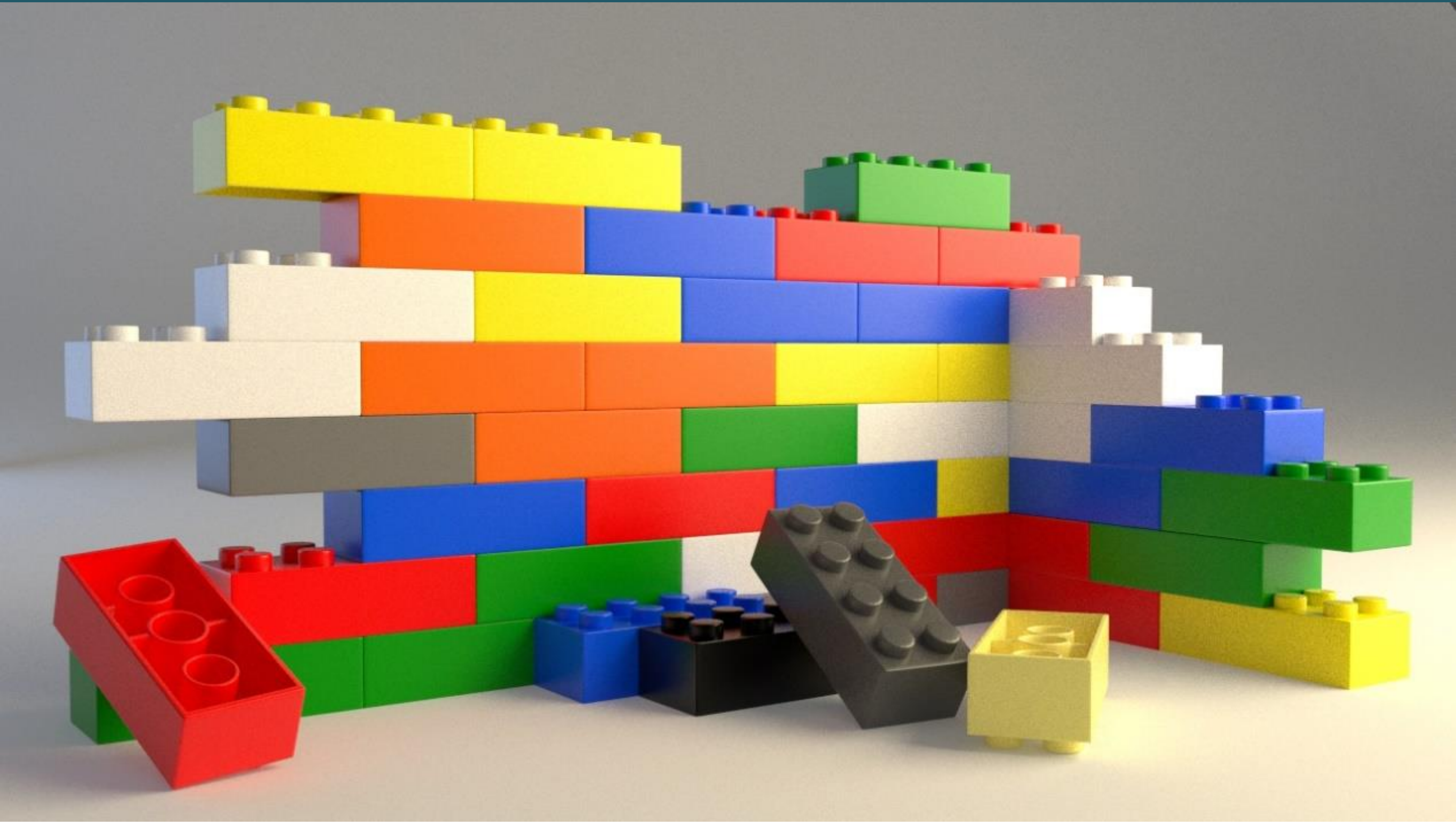
Different profiles

- For you in the current host
- For you in all hosts
- For everyone in the current host
- For everyone in all hosts

```
$Profile + $PSHome
```

```
Get-Help about_Profiles
```

Best Practices



Comment Based Help

```
<#
    .SYNPOSIS
    By using a specific formation, you can write your
    own Get-Help information
#>
```

```
Get-Help about_comment_based_help
```

Demo – Functions, Modules, Profile

Break!

Review

What would you use to load a standard set of Powershell modules every time you opened a session?

Your Powershell profile

What command should you use to load a custom module?

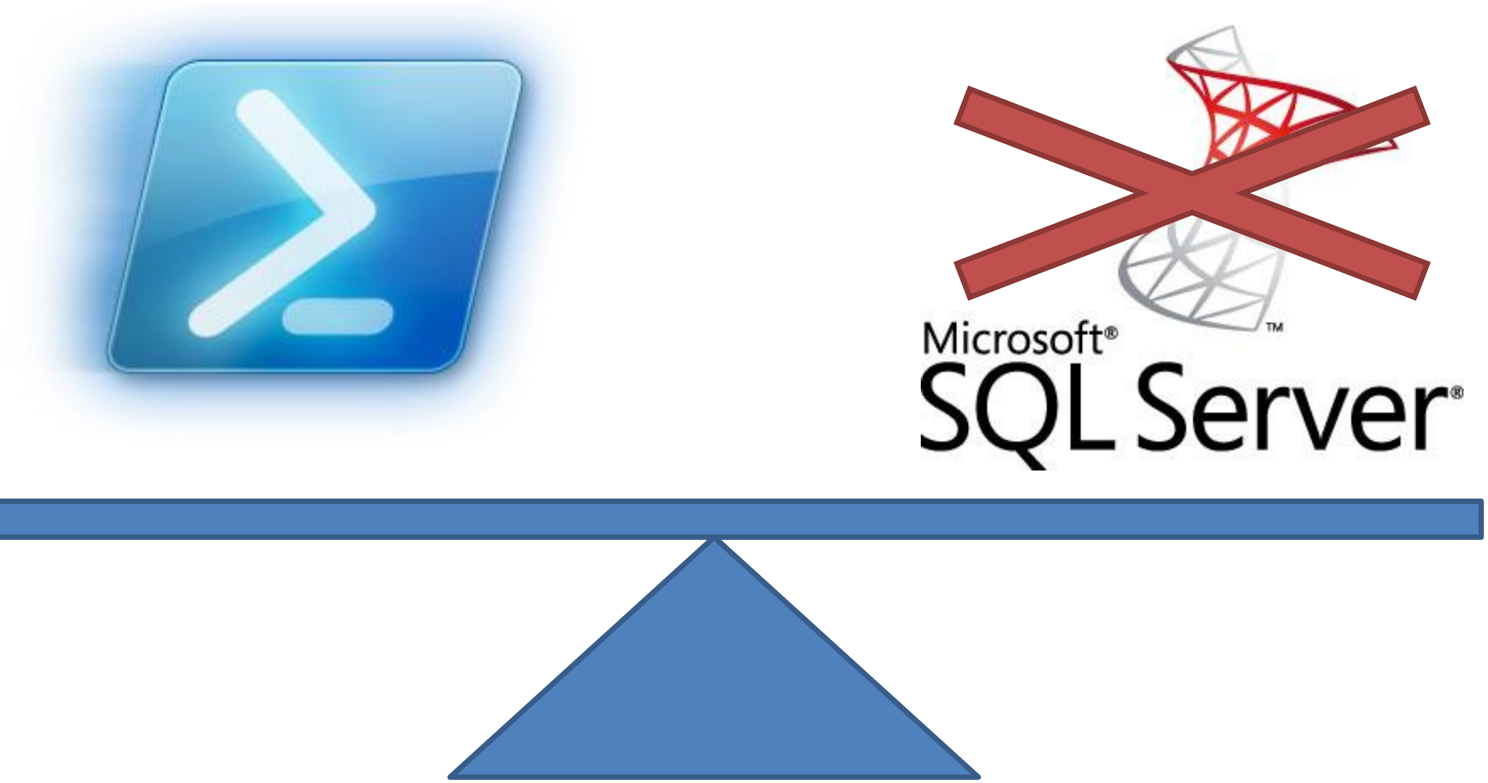
Import-Module

Where does the `param` keyword go when parameterizing a function or a script?

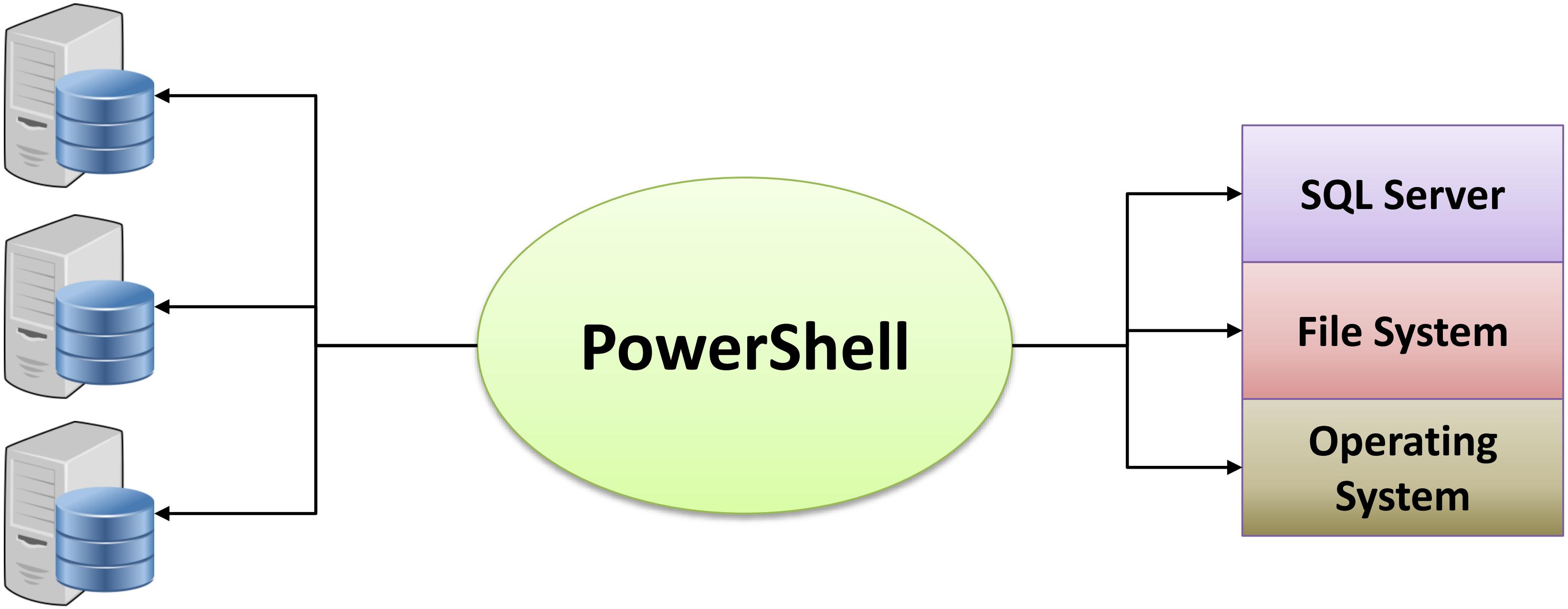
It must go at the at the beginning (can be after a comment block)

Practical Use

The Approach



What to Consider



Demo – Practical Scripts

Powershell and Server Core

What Server Core IS

Windows Server…

…with no GUI!

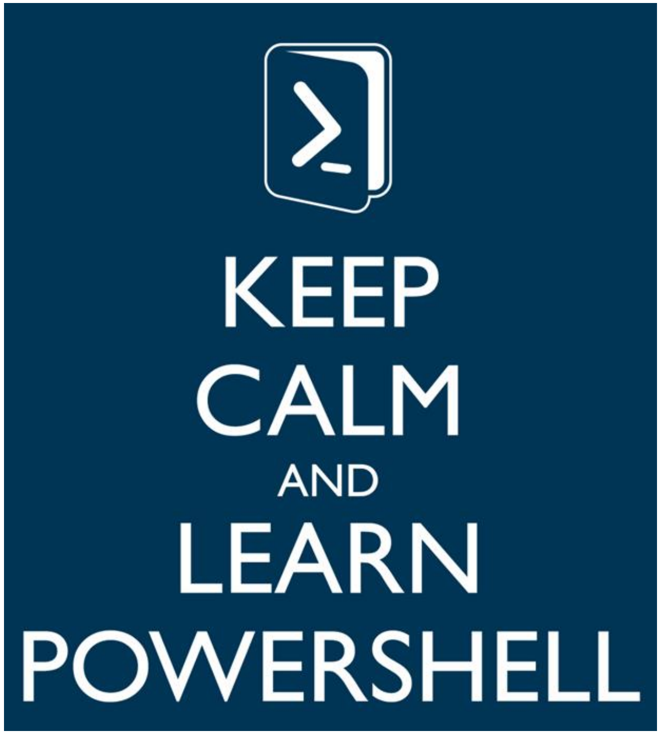
***Lean* – Smaller footprint and install**

***Stable* – Fewer applications and services**

***Secure* – Less security loopholes**

Tools to Start With

SCONFIG



First Look

Server Core Support

Feature	Supported
Database Engine Services	Yes
SQL Server Replication	Yes
Full Text Search	Yes
Analysis Services	Yes
Reporting Services	No
SQL Server Data Tools (SSDT)	No
Client Tools Connectivity	Yes
Integration Services Server[1]	Yes
Client Tools Backward Compatibility	No
Client Tools SDK	No
SQL Server Books Online	No
Management Tools - Basic	Remote Only[2]
Management Tools – Complete	Remote Only[2]
Distributed Replay Controller	No
Distributed Replay Client	Remote Only[2]
SQL Client Connectivity SDK	No
Microsoft Sync Framework	Yes[3]
Master Data Services	No
Data Quality Services	No

SQL Server Requirements

Requirement	How to install
.NET Framework 2.0 SP2	Not included in Windows Server 2012, must be installed.
.NET Framework 3.5 SP1 Full Profile	Not included in Windows Server 2012, must be installed.
.NET Framework 4 Server Core Profile	Shipped with Windows Server 2012.
Windows Installer 4.5	Shipped with Windows Server 2012
Windows PowerShell 2.0	Powershell 3.0 shipped with Windows Server 2012.

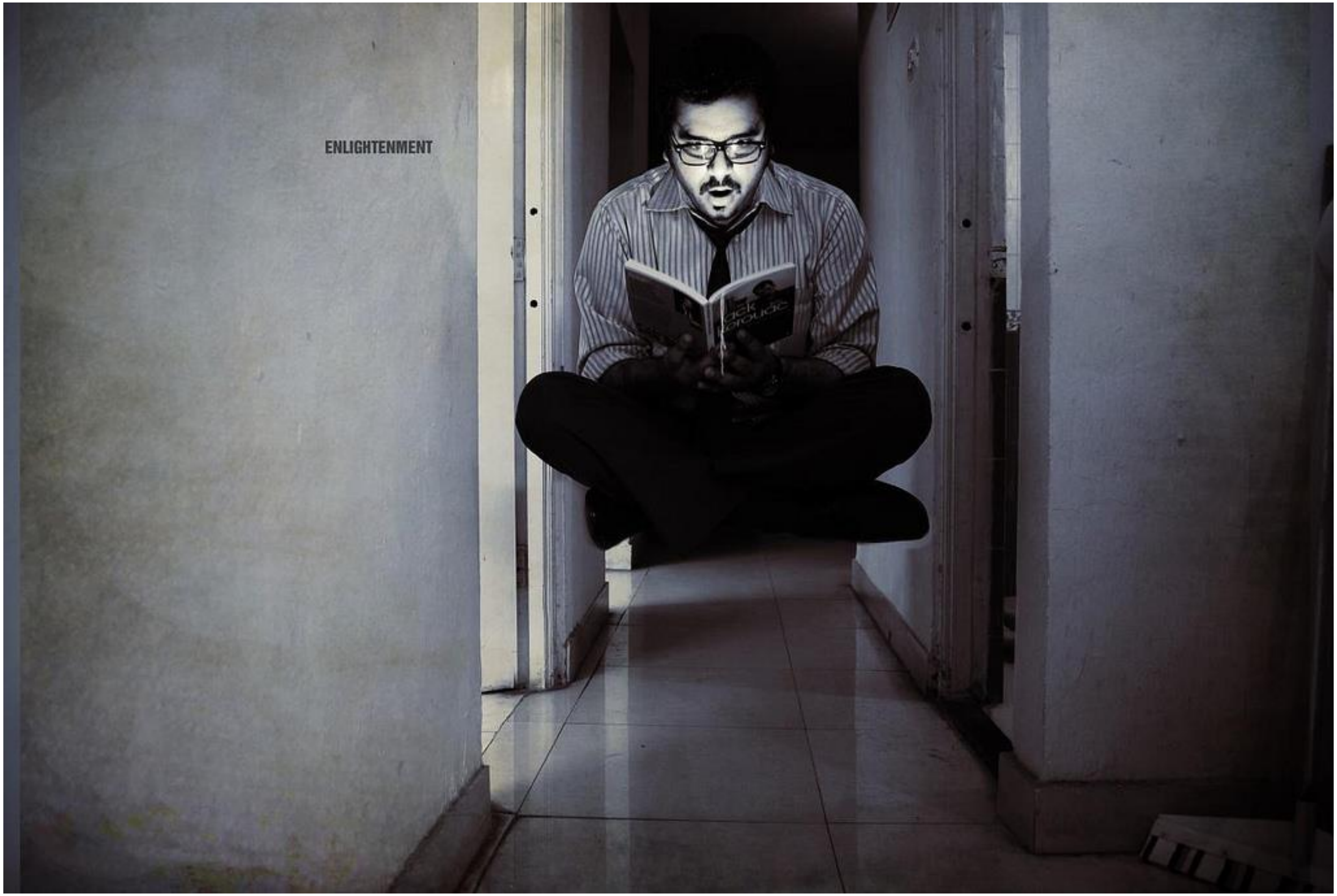
Unattended Install

Well established tool

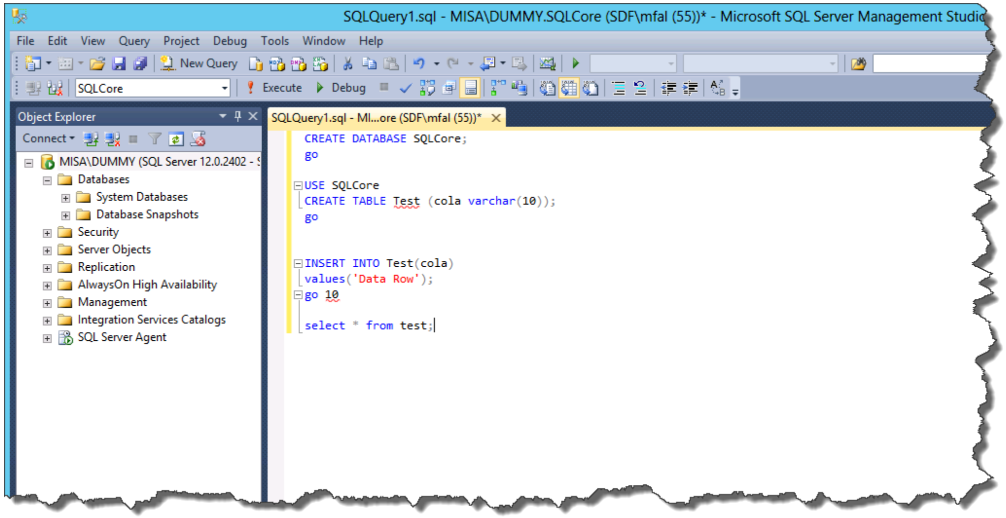
Allows for consistent SQL builds

Infrastructure as code

Demo - SQL Install



Now What?

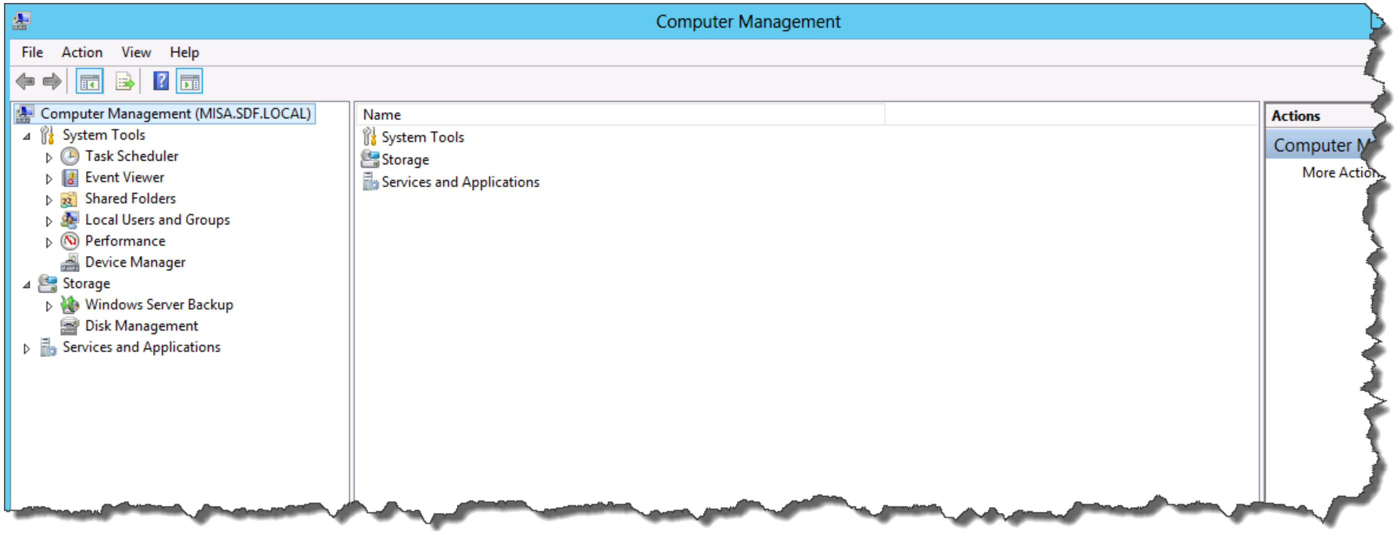

SQLQuery1.sql - MISA\DUMMY.SQLCore (SDF\mfal (55))* - Microsoft SQL Server Management Studio
File Edit View Query Project Debug Tools Window Help
New Query
SQLCore
Execute
Debug
Object Explorer
Connect
MISA\DUMMY (SQL Server 12.0.2402 -
Databases
System Databases
Database Snapshots
Security
Server Objects
Replication
AlwaysOn High Availability
Management
Integration Services Catalogs
SQL Server Agent
SQLQuery1.sql - MI...ore (SDF\mfal (55))*

```sql
CREATE DATABASE SQLCore;
go

USE SQLCore
CREATE TABLE Test (cola varchar(10));
go


INSERT INTO Test(cola)
values('Data Row');
go 10

select * from test;
```



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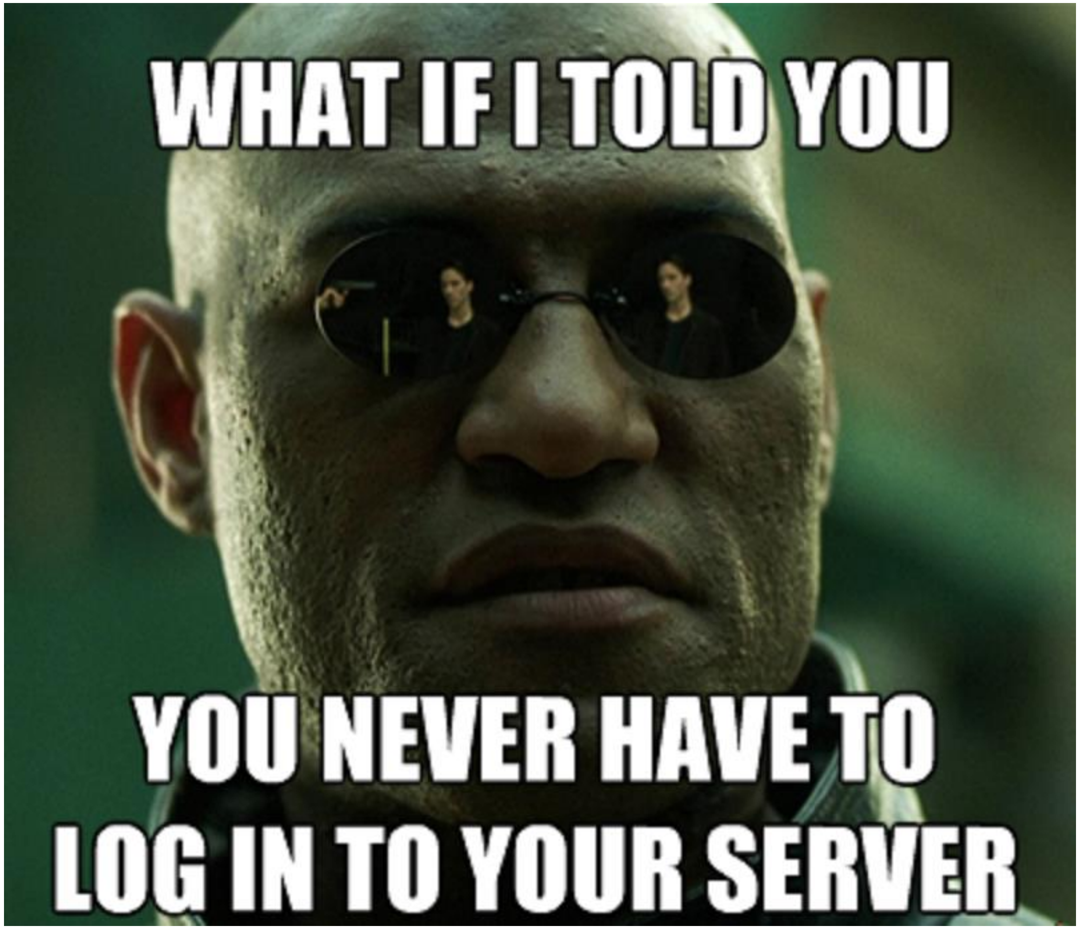
Moment of Zen



Desired State Configuration

“Killer Feature” in Powershell v4.0

Declarative **Configurations**

Resources Define What and How

Create. Deploy. Execute.

Short Answer:

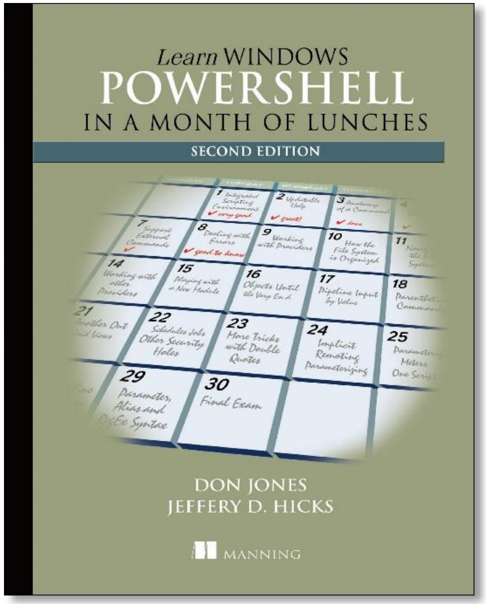
Install SQL Server ***without*** logging in

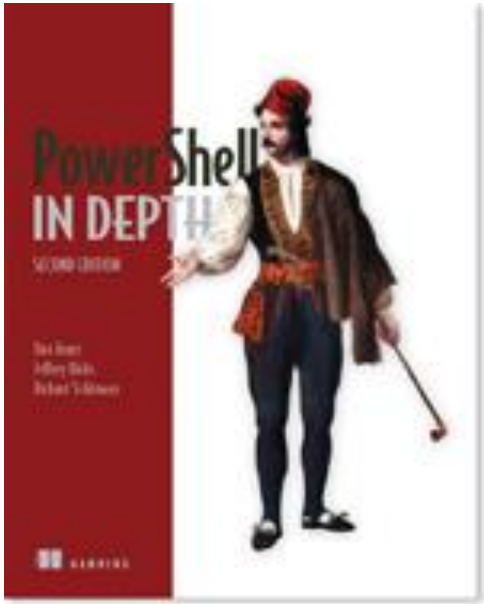
Demo - Install using DSC

So now what?

Books

- [Powershell In A Month of Lunches]
- [Powershell in Depth, 2nd Edition]





General Powershell

- The Scripting Guys (http://blogs.technet.com/b/heyscriptingguy/)
- Jeff Hicks (http://jdhitsolutions.com/blog/)
- Powershell.org (http://powershell.org/)

Bloggers

- Ben Miller (http://www.dbaduck.com/)
- Allen White (http://sqlblog.com/blogs/allen_white/)
- Kendal Van Dyke (http://www.kendalvandyke.com/)
- Laerte Junior (https://www.simple-talk.com/author/laerte-junior/)
- Aaron Nelson (http://sqlvariant.com/)

Online

Microsoft Virtual Academy

PluralSight ($$)

Other scripts

https://github.com/MikeFal

- Powershell repository (all my scripts, including WIP)
- Intro To Powershell repository (all the scripts from THIS class)

Most of all, USE IT

Find tasks to automate

Manage the file system ONLY through Powershell

Rewrite a T-SQL or other task using Powershell

And so on…

Questions

HUH?

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