PowerShell Tutorial

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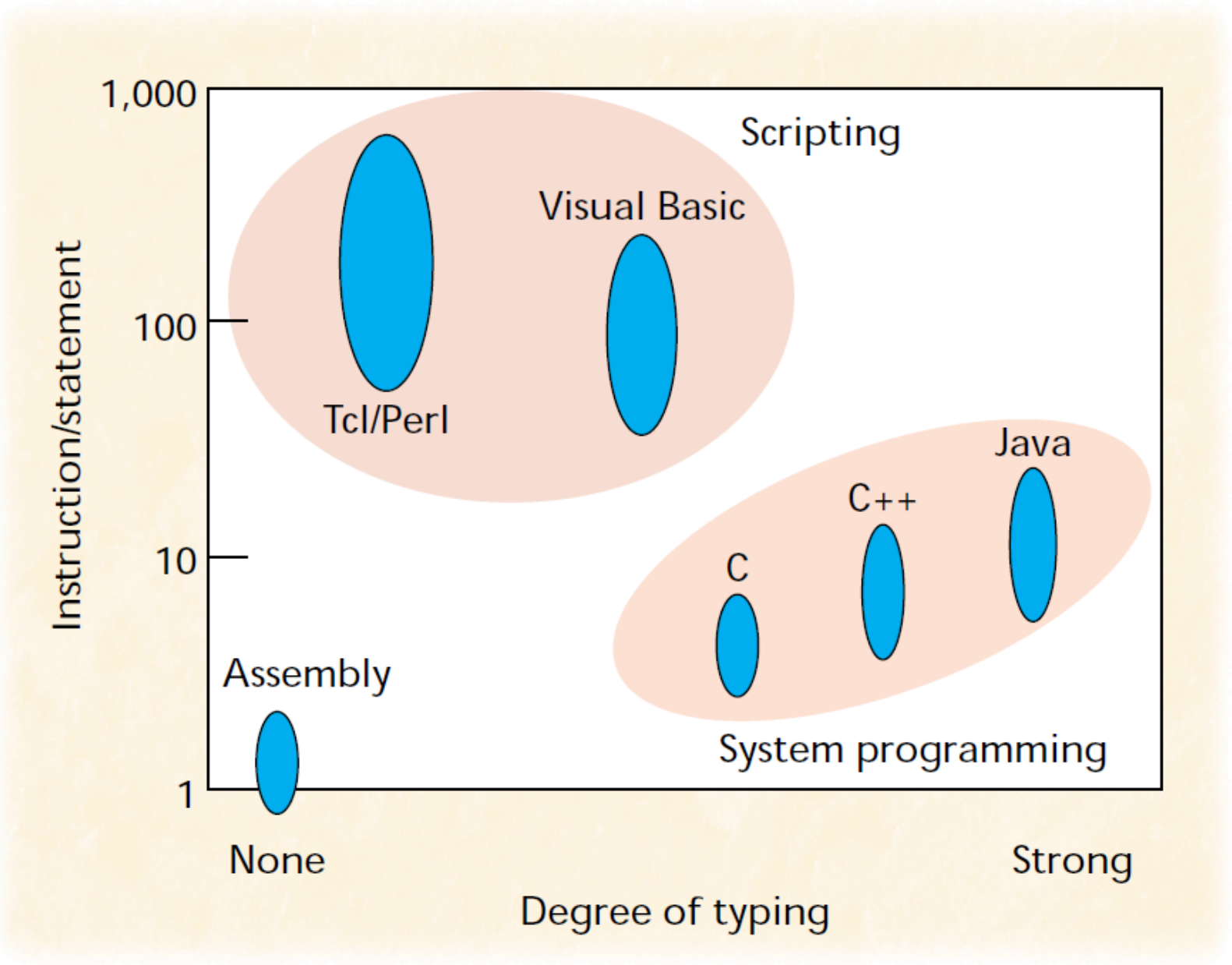

(OUSTERHOUT, J., “Scripting: Higher-Level Programming for the 21st Century”, IEEE Computer, Vol. 31, No. 3, March 1998, pp. 23-30.)

WARNING!

The following presentation is NOT meant to be a comprehensive/complete tour of the PowerShell language.

The purpose is to get you started with some basic program constructions which you will recognize based on some-sort-of-programming-background.

At the end of the presentation (Credits section) you will find pointers to more comprehensive material (reference material).

Practice

You need a Windows host running on a physical or virtual machine with working access to the internet, and with `PowerShell v2.0` installed.

Log in and open a terminal window, download the examples as we go along from

`http://www.ansatt.hig.no/erikh/tutorial-powershell/FIL`

(or download all at once with filename `powershell-examples.zip` but remember to unblock before unzip)

Hello World

```
# hello.ps1

Write-Host "hello world!"
```

execute as long as filename ends with `.ps1`:

```
.\hello.ps1
```

or direct from command line `cmd` (DOSPROMPT)

```
powershell -command "Write-Host \"hello world!\""
```

or direct from command line `powershell`

```
Write-Host "hello world!"
```

Single Variables

```
# single-var.ps1

$firstname="Mysil"
$lastname="Bergsprekken"
$fullname="$firstname $lastname"
Write-Host "Hello $fullname, may I call you" `
           "$firstname`?"
```

All variables are prefixed with $

Exercise

```
$name="Mysil"
```

- Use the properties and methods of this object to
  - ⇒ find out how many characters the string contains
  - ⇒ print the string in upper case

Single and Double Quotes

```
# quotes.ps1

$name="Mysil"
Write-Host Hello    $name
Write-Host "Hello    $name"
Write-Host 'Hello    $name'
```

Arrays

One-dimensional arrays:

```
# array.ps1

$os=@("linux", "windows")
$os+=@("mac")
Write-Host $os[1]       # print windows
Write-Host $os          # print array values
Write-Host $os.Count    # length of array
```

Arrays are created with `@(...)`

Associative Arrays

```
# assoc-array.ps1

$user=@{
        "frodeh" = "Frode Haug";
        "ivarm"  = "Ivar Moe"
        }
$user+=@{"lailas"="Laila Skiaker"}
Write-Host $user["ivarm"]   # print Ivar Moe
Write-Host @user            # print array values
Write-Host $user.Keys       # print array keys
Write-Host $user.Count      # print length of array
```

Associative arrays are created with `@{...}` and are called Hashtables in PowerShell.

Structures/Classes

A simple object used as a struct:

```
# struct.ps1

$myhost=New-Object PSObject -Property `
        @{os="";
          sw=@();
          user=@{}
         }
$myhost.os="linux"
$myhost.sw+=@("gcc","flex","vim")
$myhost.user+=@{
                "frodeh"="Frode Haug";
                "monicas"="Monica Strand"
               }
Write-Host $myhost.os
Write-Host $myhost.sw[2]
Write-Host $myhost.user["monicas"]
```

Command-Line Arguments

All command-line arguments in the array `$args`

Scriptname retrieved from the object `$MyInvocation`

```
# cli-args.ps1

Write-Host "I am" $MyInvocation.InvocationName `
           "and have" $args.Count "arguments" `
           "first is" $args[0]
```

Exercise

- Rewrite the previous script to only have one string (just one set of double quotes (")), one at the beginning and one at the end, do not use single quotes either

Input From User

```
# input-user.ps1

$something=Read-Host "Say something here"
Write-Host "you said" $something
```

Input From the Pipeline

```
# input-pipe.ps1

$something="$input"
Write-Host "you said" $something
```

can be executed as

```
Write-Output "hey hey!" | .\input-pipe.ps1
```

Input From Files

```
# input-file.ps1

$file=Get-Content hello.ps1
Write-Host @file -Separator "`n"
```

Input from System Commands

```
# input-commands.ps1

$name=(Get-WmiObject Win32_OperatingSystem).Name
$kernel=(Get-WmiObject `
         Win32_OperatingSystem).Version
Write-Host "I am running on $name, version" `
           "$kernel in $(Get-Location)"
```

if/else

```
# if.ps1

if ($args.Length -ne 1) {
    Write-Host "usage:" `
               $MyInvocation.InvocationName `
               "<argument>"
}
```

Comparison

Operator	Meaning
–lt	Less than
–gt	Greater than
–le	Less than or equal to
–ge	Greater than or equal to
–eq	Equal to
–ne	Not equal to

Boolean

Operator	Meaning
−not	Not
!	Not
−and	And
−or	Or

```
# if-num-string.ps1

if ($args.Count -ne 2) {
    Write-Host "usage:" `
                $MyInvocation.InvocationName `
                "<argument> <argument>"
    exit 0
} elseif ($args[0] -gt $args[1]) {
    Write-Host $args[0] "larger than" $args[1]
} else {
    Write-Host $args[0] "smaller than or" `
                "equal to" $args[1]
}
if (Test-Path $args[0]) {
    if (!(Get-Item $args[0]).PSIsContainer) {
        Write-Host $args[0] "is a file"
    }
}
```

Boolean example

```
# if-bool.ps1

if ((1 -eq 2) -and (1 -eq 1) -or (1 -eq 1)) {
    Write-Host "And has precedence"
} else {
    Write-Host "Or has precedence"
}

# force OR precedence:

if ((1 -eq 2) -and ((1 -eq 1) -or (1 -eq 1))) {
    Write-Host "And has precedence"
} else {
    Write-Host "Or has precedence"
}
```

Switch/Case

```
# switch.ps1

$short = @{ yes="y"; nope="n" }
$ans = Read-Host
switch ($ans) {
    yes { Write-Host "yes" }
    nope { Write-Host "nope"; break }
    {$short.ContainsKey("$ans")} `
        { Write-Host $short[$ans] }
    default {Write-Host "$ans`???"}
}
```

Where/Where-Object

```
# where.ps1

Get-ChildItem | Where-Object {$_.Length -gt 1KB}
```

Exercise

- Use `Get-Process` and `Where-Object` to
  - ⇒ list all powershell processes
  - ⇒ store the process table in an array `$procs`
  - ⇒ list all processes with a working set greater than 10MB

For loop

```
# for.ps1

for ($i=1;$i-le3;$i++) {
  Write-Host "$i"
}

# something more useful:

$file=Get-ChildItem
for ($i=0;$i-lt$file.Count;$i++) {
    if (!(Get-Item $file[$i]).PSIsContainer) {
        Write-Host $file[$i].Name "is a file"
    } else {
        Write-Host $file[$i].Name "is a directory"
    }
}
```

While

```
# while.ps1

while ($i -le 3) {
    Write-Host $i
    $i++
}

# something more useful:

$file=Get-ChildItem
$i=0
while ($i -lt $file.Count) {
    if (!(Get-Item $file[$i]).PSIsContainer) {
        Write-Host $file[$i].Name "is a file"
    } else {
        Write-Host $file[$i].Name "is a directory"
    }
    $i++
}
```

Foreach loop

```
# foreach.ps1

foreach ($i in Get-ChildItem) {
    Write-Host $i.Name
}

# with associative arrays

$user=@{
        "frodeh" = "Frode Haug";
        "monicas"  = "Monica Strand";
        "ivarm"  = "Ivar Moe"
        }
foreach ($key in $user.Keys) {
    Write-Host $user[$key]
}
```

ForEach

If we want to read from the pipeline and do stuff object by object:

```
# foreach-pipe.ps1

foreach ($i in $input) {
    $foo += @($i)
}
Write-Host "size of foo is" $foo.Count
```

or

```
# foreach-object-pipe.ps1

$input | ForEach-Object {
    $foo += @($_)
}
Write-Host "size of foo is" $foo.Count
```

```
$ Get-ChildItem | ./foreach-object-pipe.ps1
size of foo is 20
```

Operators

Operator	Meaning
+	Add
–	Subtract
*	Multiply
/	Divide
%	Modulus

```
# math.ps1

Write-Host "3+5 is" (3+5)
```

Functions

```
# func.ps1

# declare:
function add($a, $b) {
    Write-Host "$a+$b is" ($a+$b)
}
# use:
add 5.12 2.56
```

Regular expressions intro 1/5

Special/Meta-characters:

```
\ | ( ) [ ] { } ^ $ * + ? .
```

These have to be protected with \, e.g.

```
http://www\.hig\.no
```

> *To match `c:\temp`, you need to use the regex `c:\\temp`. As a string in C++ source code, this regex becomes `"c:\\\\temp"`. Four backslashes to match a single one indeed.*

(from `http://www.regular-expressions.info/characters.html`):

Regular expressions intro 2/5

Describing characters:

Operator	Meaning
.	Any single character
[abcd]	One of these characters
[^abcd]	Any one but these characters
[a-zA-Z0-9]	A character in these ranges

Regular expressions intro 3/5

Grouping:

Operator	Meaning
( )	Group
|	OR

Anchoring:

Operator	Meaning
^	Beginning of line
$	End of line

Regular expressions intro 4/5

Repetition operators/Modifiers/Quantifiers:

Operator	Meaning
`?`	0 or 1 time
`*`	0 or more times
`+`	1 or more times
`{N}`	N times
`{N,}`	At least N times
`{N,M}`	At least N but not more than M

Regular expressions intro 5/5

Finding URLs in HTML:

```
(mailto|http)://[^"]*
```

Each line should be an email address:

```
^[A-Za-z0-9._-]+@[A-Za-z0-9.-]+$
```

PowerShell example

```
# regexp.ps1

$input | ForEach-Object {
    if ($_ -match
         "^[A-Za-z0-9._-]+@([A-Za-z0-9.-]+)$") {
        Write-Host "Valid email", $matches[0]
        Write-Host "Domain is", $matches[1]
    } else {
        Write-Host "Invalid email address!"
    }
}
```

Advanced stuff

See the complete Mastering PowerShell book at

`http://powershell.com/cs/blogs/ebook/`

for much more of what you can do with PowerShell

Credits

http://refcardz.dzone.com/refcardz/windows-powershell
http://powershell.com/cs/blogs/ebook/
http://technet.microsoft.com/en-us/library/ee692948.aspx
http://www.techotopia.com/index.php/Windows_PowerShell_1.0_String_Quoting_and_Escape_Sequences
http://dmitrysotnikov.wordpress.com/2008/11/26/input-gotchas/
http://stackoverflow.com/questions/59819/how-do-i-create-a-custom-type-in-powershell-for-my-scripts-to-use
http://www.powershellpro.com/powershell-tutorial-introduction/
http://en.wikipedia.org/wiki/Windows_PowerShell
http://www.johndcook.com/powershell.html
http://www.regular-expressions.info/
OUSTERHOUT, J., “Scripting: Higher-Level Programming for the 21st Century”, IEEE Computer, Vol. 31, No. 3, March 1998, pp. 23-30.)